Grinding and Finishing

Ingenious Grinding Methods Replace Milling, Tool Inventory, Maintenance at Whirlpool Corp.

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—also in this issue:

How to Install Coolant Cleaning Equipment

Quality Grinding Wheel Manufacturing Means Elaborate Control Techniques

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Washington News - Questions and Answers - Shop Hints and Kinks - A.S.A. News

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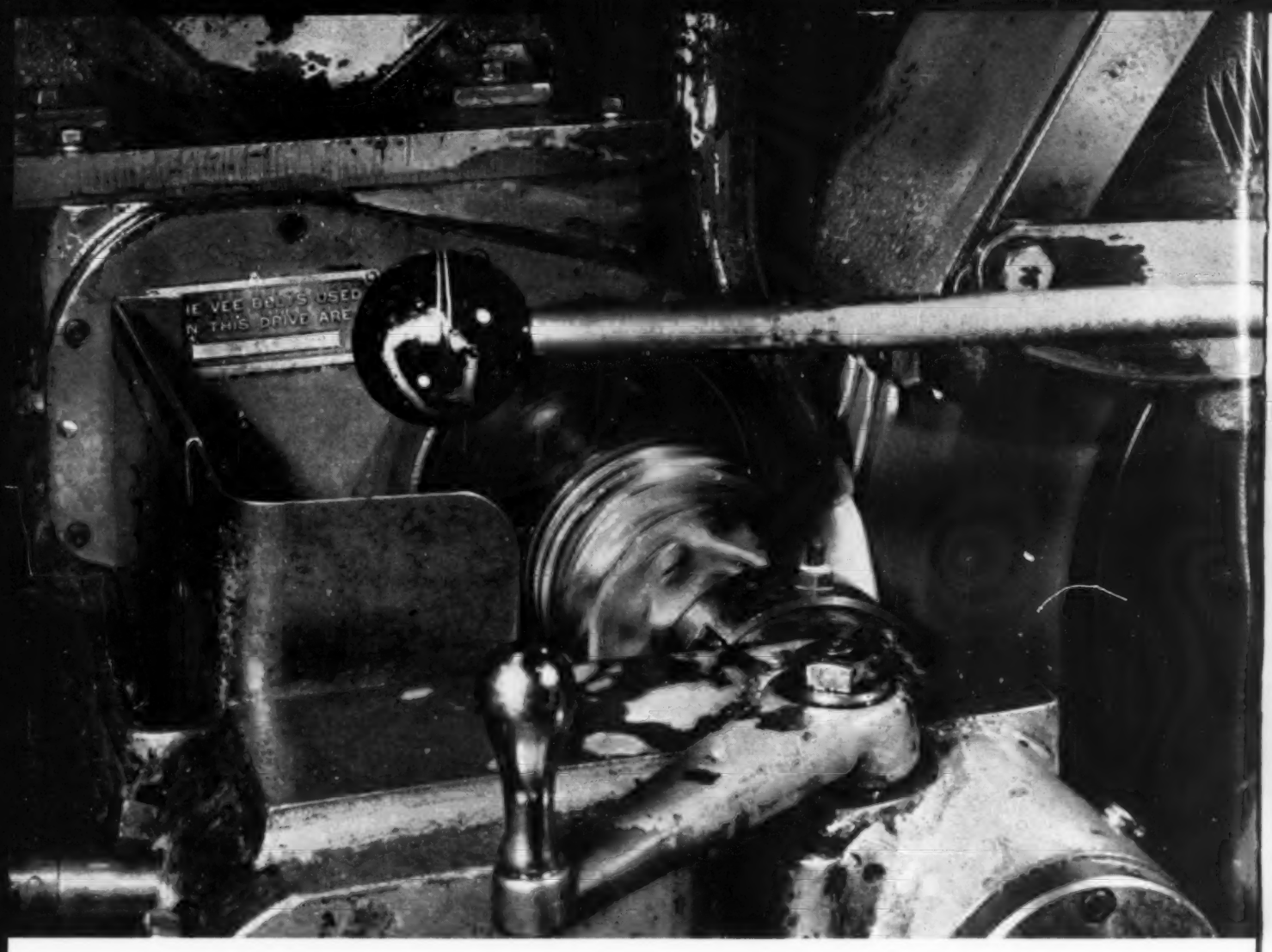

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*Name on request

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---wherever abrasive operations are performed

grinding and finishing

Contents • April 1958

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assistant editor

Madrene Bierma
editorial assistant

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BPA

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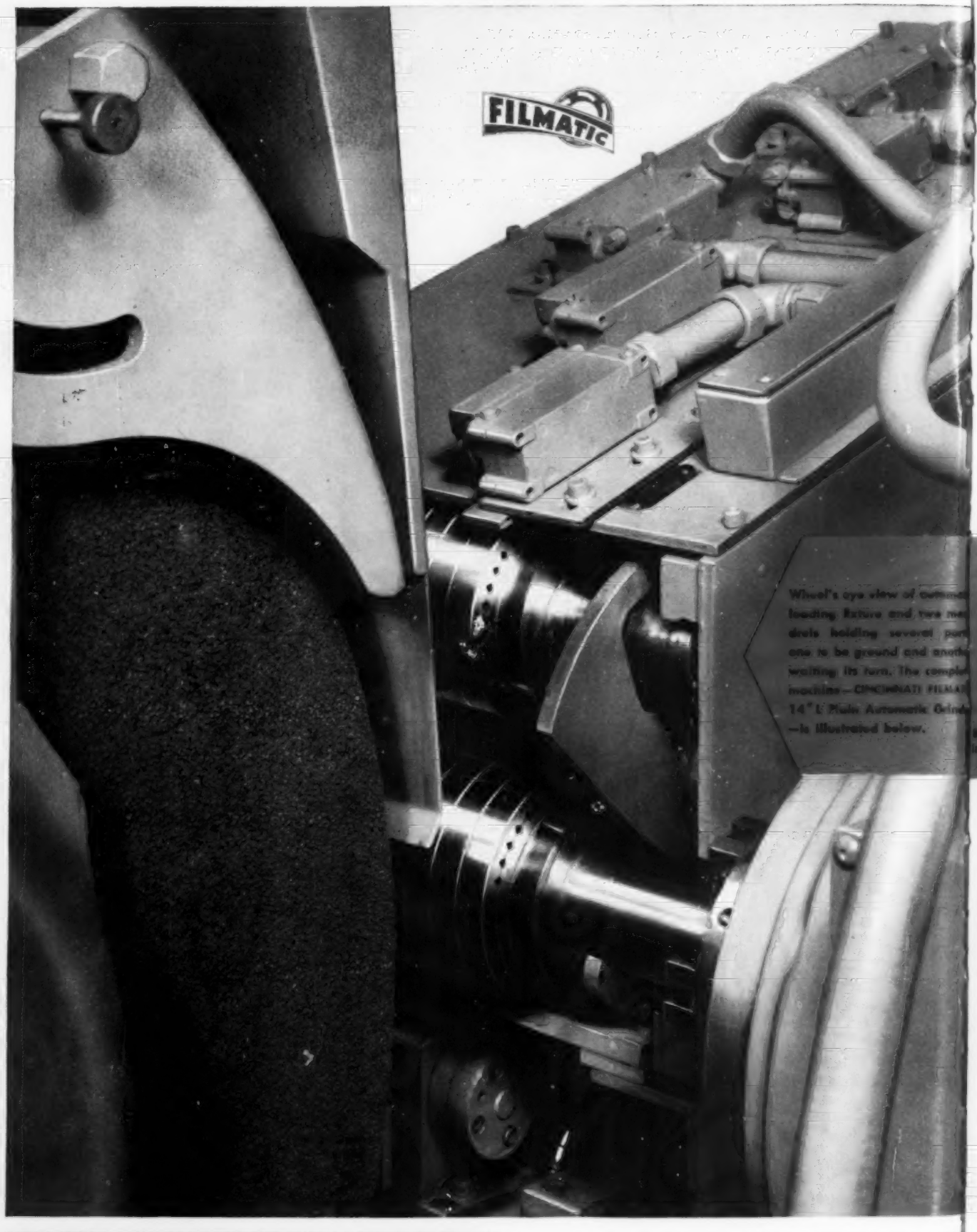


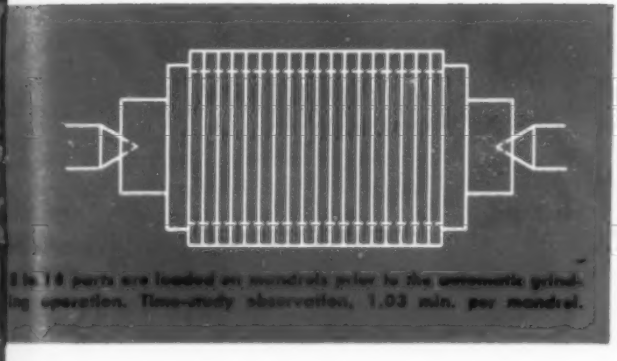
Wheel's eye view of automatic loading fixture and two nests of drills holding several parts, one to be ground and another waiting its turn. The complete machine—CINCINNATI FILMATIC 14" L Plain Automatic Grinder—is illustrated below.

CINCINNATI®

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES • LAPPING

Cincinnati Filmatic 14"L Plain Grinder

. . . automatically grinds and sizes narrow parts by the dozen



8 to 14 parts are loaded on mandrels prior to the automatic grinding operation. Time-study observation, 1.03 min. per mandrel.

Production methods dictated a centertype grinder, and good business judgment dictated a CINCINNATI with maximum automation to grind the O.D. of internal gears manufactured in big volume. A CINCINNATI® FILMATIC 14"L Plain Grinder, completely equipped for automatic grinding, does a highly profitable, dependable job. Features of low-cost operation include:

- **Automatic loading fixture**
- **Automatic grinding cycle**
- **Automatic air-electric gage sizing, with Cincinnati's exclusive cycle time stabilizer**
- **Automatic behind-the-wheel truing, incorporating cycle counter**
- **Automatic grinding wheel reciprocation, interlocked with the truing cycle**
- **Gap eliminator (reduces "cutting air" portion of infeed cycle)**
- **Hydraulic footstock**

FILMATIC grinding wheel spindle bearings, automatic wheel balancing and other standard features and construction characteristics tie the foregoing automation elements together to form a dependable, high production, controlled accuracy grinding machine. ¶ This precision centertype grinder is typical of the fine engineering developed by Cincinnati's Automation and Engineering Service specialists. These men are ready to give you the benefit of their experience in six distinct types of precision grinding: centertype, centerless, chucking, Micro-Centric, centerless lapping, roll. Make Cincinnati your headquarters for fine grinding machines built to your requirements. Metalworking plants throughout the world have found it profitable to do so.

CINCINNATI FILMATIC 14"L Plain Hydraulic Grinding Machine, equipped for completely automatic infeed grinding operations.

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"ELGIN DYMO-C*

gives us the most uniform Superfinish"

Says David Schreiber,
President, Master Carbide Die Corporation

Master Carbide received an order to make integrators for Ground Position Indicators—and with it a real problem. The integrators were intended for jet fighters, and involved welding together several materials with different coefficients of expansion. Rigid requirements included accuracy of perpendicularity, concentricity of diameters, and flatness (within one wavelength of light). Most important of all was a uniform superfinish from 0-½ micro-inches (R.M.S.). Trying various makes of diamond compound, Master Carbide decided on Elgin Dymo-C*. They found it gave the most uniform finish of all. Elgin Dymo-C* is accurately graded to insure absolute uniformity of particle size. Test it or ask your Elgin man to show you proof. Then—for the most uniform finish possible—specify ELGIN DYMO-C*.

*C for Carbide

Abrasives Division
ELGIN NATIONAL WATCH COMPANY
ELGIN, ILLINOIS

Letters to the Editor

Grinding and Honing at Timken's

Would you please send us a copy of your January issue as soon as possible? We are very much interested in an article on The Timken Company Bucyrus plant in that issue.

Mrs. Donna Beekman
Batten, Barton, Durstine & Osborn, Inc.
Cleveland, Ohio

Abrasive Belts

In your publication for December, 1957 there was an article by S. L. Johnson, Manager, New Methods Dev. Section, Coated Abrasives and Related Products Div., Minnesota Mining and Mfg. Co., St. Paul, Minn. We should be interested to know whether it would be possible for us to have 20 copies of this particular article, which we found most interesting.

Perhaps you will give us a price on these.

Managing Director
Thos. Goldsworthy & Sons, Ltd.
Manchester 15, England

Training Course

I have been a reader of your publication, *Grinding and Finishing*, for about two years. I find it very educational and in some instances helpful.

Now in your February issue I ran across an article about a training course in fluid power equipment. Inasmuch as I am employed in the grinding and maintenance division of tooling by a hydraulic manufacturer, I am interested in the course entitled "Installation, Operation and Maintenance of Fluid Power Equipment." Therefore would you be kind enough to give me information as to how to join this training course; what qualification and education you must have, and as to the cost of the course.

Frederick Fassow
Blackhawk Mfg. Co.
West Allis 14, Wis.

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NEW MANHATTAN SAFETY BACK FLARED CUP

Not simply a new safety "feature" . . . not merely a design "improvement." Here's a *totally new concept* of flared cup wheel design *and* construction . . . developed by Manhattan engineers to give the greatest safety and performance advantages possible for flared cup wheel users. Manhattan's revolutionary SAFETY BACK Flared Cup puts portable wheel *safety* where it counts the most—in *original* strength and breakage resistance!

SAFETY BACK far surpasses ordinary safety features such as anchor bushings, safety rings, special hub mountings, or revolving cup guards. With SAFETY BACK, steel covers the *entire* back of the flared cup . . . extends down the side to offer a degree of reinforcement and breakage resistance never before possible!

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- **Easy Mounting—Easy Operation**
- **Improved Mounting Base**
- **One Piece Assembly**
- **Requires No Adjustment**

Only SAFETY BACK gives you these features—*plus* Manhattan's custom-engineered abrasive bond for *faster* removal of *more* metal on your particular job—at no additional cost! For "More Use per Dollar" in portable grinding operations, you can't get a faster cutting, longer lasting—*safer* wheel than MANHATTAN.

Let a Manhattan abrasive wheel engineer show you the advantages of SAFETY BACK Flared Cups, and other types of Manhattan high speed, heavy duty abrasive wheels. Write for Bulletin 7157.

RM-752R1.

GRINDING WHEEL INSTITUTE MEMBER

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. . . wherever abrasive operations are performed

Grinding and Finishing Around the Country

First View of Army's Revolutionary New Aircraft

First illustration of field operation of revolutionary new aircraft, the U.S. Army-Doak Model 16 VTOL Research Vehicle, designed and built by Doak Aircraft Company, Inc., Torrance, Cal.

Ducted propellers on the wing tips rotate through ninety degrees to convert in flight from vertical take-off and hovering to normal horizontal flight. Entire airplane remains in conventional horizontal attitude at all times. Like the helicopter, it requires no airport for take-off or landing, but operates in the air as a conventional aircraft with longer range and higher speed than the helicopter.

Here the artist shows a Doak 16 rising vertically from a small jungle clearing (bottom). Next, the propeller ducts are rotating toward horizontal position (middle). Finally, (at top) the propellers are horizontal and the Doak 16 is off at high speed as a normal airplane. •

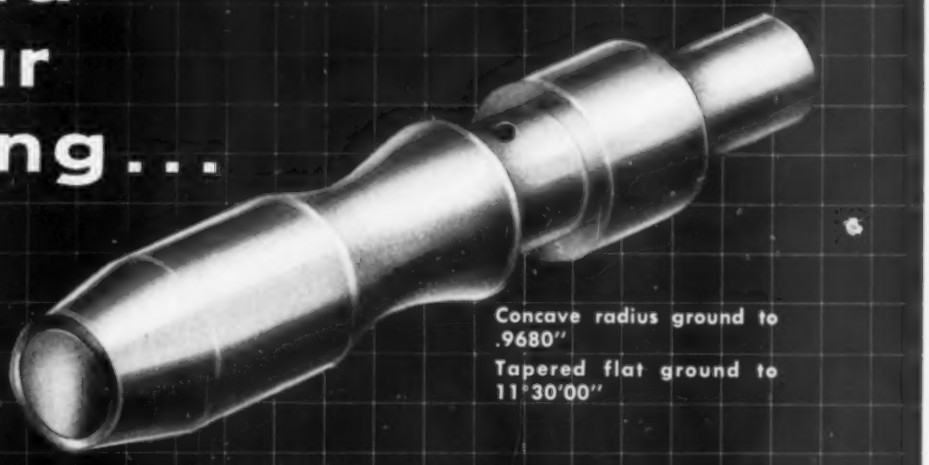
Burned to a black waffle pattern by searing air friction heat, the Lockheed X-7 ramjet missile has set a new speed mark making it the fastest air breathing vehicle in the U.S. The Air Force also said the "bird" set a new altitude record for ramjet missiles, bordering on the fringes of the earth's atmosphere. The X-7, built by Lockheed's Missile Systems division for the AF's Air Research and Development Command, is used to prove powerful ramjet engines that propel some of the nation's most advanced defense weapons. It is recoverable by parachute and nose spike to be flown time and again. •

Plant Data Processing Or Go Out of Business

Any company not actively planning for electronic data processing today stands an excellent chance of being out of business within ten years, says Willis K. Drake, director of marketing for Control Data Corporation, Minneapolis.

The challenge for the next ten years is two-fold, Drake said. First, American business must develop a new breed of administrator who is trained to convert production and business methods into data processing terms. Second, the computer industry must continue to make its products more compact, more reliable and less expensive. •

hoglund contour dressing...



Concave radius ground to .9680"
Tapered flat ground to 11°30'00"

Hoglund Model 79 Dresser features automatic, hydraulic operation.

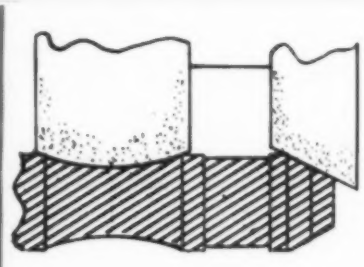
puts metering valves on production • grind basis

"Tenth tolerance" grinding — while routine with Hoglund Contour Wheel Dressers — need not be your prime requirement for their profitable use. Hoglund production economies are equally important.

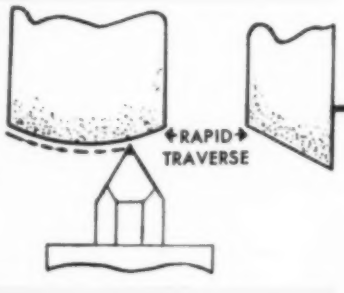
For instance, Hoglund dressers enable grinding of several faces simultaneously, as on this metering valve. In tooling up for the valve, the manufacturer found that ordinary wheel dressing techniques would require two separate grinds to maintain repeat accuracy at the desired rate. Choice of a Hoglund Model 79, however, enabled generation of the contours with one dresser and one grinding pass.

Like all Hoglund dressers, the Model 79 features: inclined plane cam reduction system; precision hardened and ground ball raceways and slides; automatic, hydraulic operation; maintenance-free service with assured repeat accuracy.

Whatever your problem — complex contours, accuracy to tenths, or the dictatorial need for economy — specify Hoglund. Over 120 models available for all types of new and existing equipment.



Double face wheel simultaneously grinds radius and flat.



Optically pre-set diamond dresses both faces in one pass.

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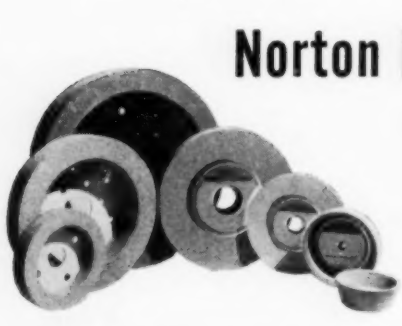
Norton K† Bond CRYSTOLON* wheels bring big advantages to offhand grinding



Here's a combination of vitrified bond and silicon carbide abrasive that delivers remarkable results — particularly in offhand sharpening of single-point carbide tools. You can get these wheels in dense, medium, or porous structure — for most efficient action regardless of the area of contact.

Also, CRYSTOLON abrasive is made in green or gray types—green, 39C, being first choice in a majority of carbide applications.

In addition, half-grade increments of hardness are available, enabling us to "pin-point" wheel specifications to minimize your grinding costs.

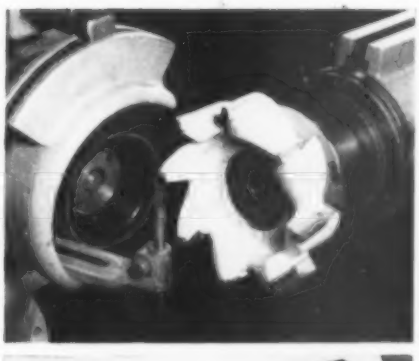
And the Norton K Bond is one of the most radically improved vitrified bonds ever developed. One big advantage is: *it assures closest possible duplication of wheel specifications.* Which means that every time you reorder K Bond wheels you get exactly the same top performance.

carbide grinding economies?

Catch 'em all fast— with the finest lures made

You cut grinding costs to rock bottom with Norton's outstanding wheel selection and service

Norton Diamond Wheels, mined or man-made . . . carbide grinding's Certified Crown Jewels



Norton was first to introduce all three bond types of diamond wheels: resinoid, vitrified and metal . . . does all its own checking and sizing of diamonds . . . duplicates wheel specifications with constant accuracy.

Resinoid bonded wheels are best for such jobs as precision grinding of cutters, form tools and die blanks. These wheels are available in several resinoid bond types — B type for wet grinding — B6 type for dry grinding.

Vitrified bonded wheels are used for sharpening single-point cutting tools, grinding chip grinders and for surfacing carbide dies.

Metal bonded wheels are sometimes preferred for grinding chip breakers, for certain offhand grinding jobs, and for cutting off sintered carbide blanks, etc.

Norton leadership in diamond wheel manufacture continues whether the diamonds used are natural or man-made. And with each Norton diamond wheel you get a certificate of diamond concentration. Signed by the President of the Company, this certificate is your safest possible buying guide.

W-1843

The Complete Line, Completely Serviced

Norton not only supplies the most extensive line of wheels for carbide grinding. As the world's largest producers of abrasives it maintains the most modern equipment designed for product quality control. Expert engineering assistance and prompt deliveries are also geared to provide the wheels you need for top quality, lowest cost carbide grinding. For these helpful services, see your Norton Abrasive Engineer or Distributor. Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

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There was a time when muscle power—and plenty of it—was needed to finish off a smooth surface. Today, air power, directed through a Buckeye tool, has replaced muscle power. The work gets done faster, naturally . . . and better, of course.

We don't imagine you're still using a wood block and emery cloth, but it's just possible you're not using a modern Buckeye air tool. And that's the only way you can be sure you're doing your finishing work the best and most economical way.

Our Catalog A-10 contains complete information on the entire line of Buckeye abrasive tools, all of it both interesting and helpful to all portable tool users. If you don't have a copy, send us your name, company and address and we'll correct that situation promptly.

In Air Tools, Your Best Buy Is Buckeye

Buckeye Tools CORPORATION

DIVISION 45 • DAYTON 1, OHIO

Grinding and Finishing Around The Country . . .

Income to Grow

By 1975, the average income of American families, after payment of all taxes, should be at least $7,100, as compared with a present average disposable income of $5,300 per family, the Committee for Economic Development predicted.

"Achievement of this high average income is not an imagined utopia, it is a practical goal for practical men," CED's Research and Policy Committee declared in releasing the results of a study by a subcommittee of businessmen and economists.

Entitled "Economic Growth in the United States—Its Past and Future," the statement called for "unending vigilance" by both individuals and government to assure that the most is made of the nation's growth-producing potentials. It stressed improvement of public education, continuous investment in enterprise, increased private savings, mobility of both labor and capital, efficient management of business and of government, and rising foreign trade as among the essentials for growth. •

Profit Sharing is Profit Squeezing

The current campaign for "profit-sharing" is actually "profit-squeezing" and the "principal victims would be its intended beneficiaries—the employees of American business," according to Roger M. Blough, chairman of the board of U.S. Steel Corp.

Mr. Blough said that although "decked out in a new bib and tucker" the purpose of those proposing the program is to "share the life right out of employer's profits—the fellow who is supposed to provide the jobs."

Of "three great propaganda campaigns converging headlong on Detroit," he said, "the one against profits could well be the most disastrous for us all—employees and employers alike."

The two others are: A campaign from iron curtain sources to undermine America's faith in its way of life and "in the domestic field" a cure for the slump which would call for "a few more shots of the hair-of-the-inflationary-dog-that-bit-you." • • •

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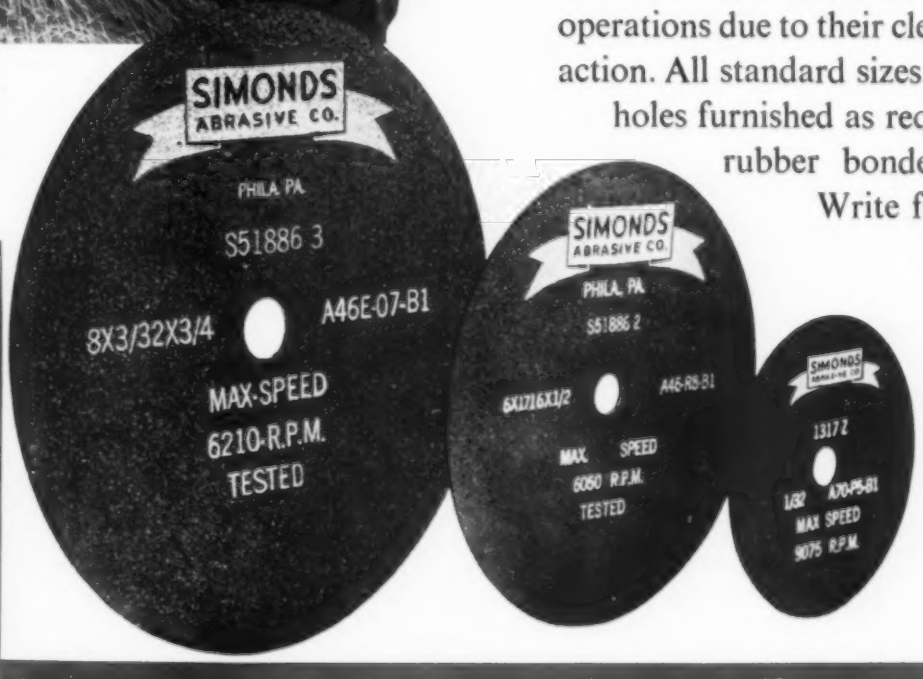
ABRASIVE CO.

CUT-OFF WHEELS

for *FAST, CLEAN-CUTTING* on *ALL* materials

Resinoid bonded to stand up to the rigors of high-speed grinding! Rubber bonded for wet or dry cutting under severe-stress and strain! Simonds cut-off wheels, in either bond, save time, money and materials with speedy, accurate cutting. You can also eliminate finishing operations due to their clean-cutting action. All standard sizes. Drive pin holes furnished as required with rubber bonded wheels. Write for bulletin ESA 163.

For all metals, including hard alloys, and non-metals except wood.



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News of Metalworking

No Depression

CHICAGO: Two factors alone could be sufficient to guarantee that we are not headed into another depression like the '30's, says Robert C. Tyson, chairman of the finance committee of US Steel. He listed the two factors as: 1. We have not had a great speculative low-margin stock market; 2. The postwar housing boom has been financed by home mortgages which can be paid off like rent and in which much of the debt is also guaranteed or insured by the government.

He stressed that remedial action should be taken to correct faults in our tax laws and labor practices which stand as hindrances to further economic development.

Three matters could handicap our recovery efforts: taxation, monetary and fiscal policies, and labor policy.

He said that today the company that operates more efficiently than another pays a relatively higher tax and so, in effect, pays a penalty for being efficient. •

Plenty of Business

ROYAL OAK: "This may not be the year for sales records, but there will be plenty of business for those who dig for it," according to William F. Beckman, vp, Sherman Products, Inc., manufacturers of earth-moving and materials handling equipment.

Sherman, in an aggressive sales campaign, is finding new markets and bringing in orders from many fields of activity. Beckman said that in 1951 it was believed that the market for digging machinery had reached the saturation point, but the determination to keep plugging for business where there was not supposed to be any produced surprising results. •

Machine Tools to Snap Back

NEW ORLEANS: "We can increase the volume of new orders for 1958 over 1957, in spite of our slow start," says Frank H. Habicht, president of the American Machine Tool Distributors' Association. "While attending regional meetings I talked with distributors and customers in many different parts of the country. Everywhere I got the feeling of cautious optimism."

Habicht pointed out that what this country needed was "renewed enthusiasm."

"The greatest potential for new machine tool business this year is the dire need of all manufacturers to beat the price-cost and profit squeeze and obtain higher levels of output per man hour." •

Worst Behind Us

NEW YORK: According to a monthly survey sponsored by the National Association of Purchasing Agents members believe the bottom of the business downturn has been reached and that we're on the way up. However, business may remain dull for a while. New orders in late March maintained the gains made in February. Two-thirds of the PAs surveyed said orders were better than or equal to orders in February. In spite of this members are still maintaining a low inventory level; levels approaching those in mid-1954. •

3 Millions for Grinding Machines

CANTON: Over three million dollars will be invested by The Timken Roller Bearing Company of Canton, Ohio, in the modernization of the cup and cone grinding departments of its Canton and Columbus bearing plants, and for new major equipment for its Bucyrus Bearing Plant. Some 117 machines, including cup and cone grinders, cone honers and cup air gages, were ordered from The Heald Machine Company and the Cincinnati Milling Machine Company. Delivery is expected late in 1958 and pilot equipment is due to arrive in Canton in June, July and August for testing. Completion of the modernization program will give the Timken Company the most up-to-date grinding departments in the world. •

New Foundry

SCHENECTADY: GE will establish a $3,700,000 large steel casting foundry. It will be located in the present Iron Foundry building in the Schenectady plant. Re-equipping of the present 95,000 square foot building is scheduled to begin this summer and be completed in 1960. The foundry will have a capacity of 50% more than the present level which is 1,000 tons of castings per week from the combined operations at Everett-Lynn, Elmira, Schenectady, New York and Erie. •

Expansion of Missile Parts

TOLEDO: Dana Corp. will expand its activities in the aircraft and missiles parts field. Precision aircraft universal joints and drive shafts are being made at its Pottstown, Pa. division and power plants for the Army's all-weather LaCrosse artillery missile at its Parish division, Reading, Pa. •

Backlog High for Martin

BALTIMORE: Current backlog of business of The Martin Co. stands at $795,000,000. Missiles and associated equipment constitute approximately 60% of the backlog. •

Chrysler Coordinates

DETROIT: Chrysler Corporation announced four major steps in its long-range program to coordinate basic manufacturing and car assembly operations. 1. Body building and assembly operations for Imperial cars will be transferred from the Jefferson Ave. plant to its Warren Ave. plant 2. De Soto Fireflite and Firedome body and assembly operations will be transferred from the Warren Ave. and Wyoming Ave. plants to the Jefferson Ave. plant. 3. Dodge passenger car engine and truck engine operations presently located at the Dodge Main plant will be discontinued, and Dodge engines will be built at the Mound Road and Trenton, Mich., engine plants. 4. Chrysler engine operations will be discontinued at the Jefferson Ave. plant, and Chrysler engines will be built at the Trenton Engine plant.

A major new project underway is construction of a 1,500,000 square-foot car assembly plant near St. Louis, Missouri, which is scheduled for completion in 1959. • • •

shamrock

top performer for automatic screw machines

Shamrock, a water-soluble chemical emulsion combining good cooling and extreme-pressure lubricating properties, is giving excellent service in single and multiple spindle automatic screw machines. It is also widely used when machining at moderate feeds and speeds for broaching, threading and tapping, as well as for drawing and stamping. It contains no sulfur or chlorine commonly used as extreme pressure additives, and it completely eliminates all smoke nuisance as well as the dermatitis problem. Shamrock helps keep any shop clean.

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Letter From Washington

By **D. M. Carlson** . . . . May 1958

McDonnell tells how to end recession.

● The best way to bring a swift end to the recession would be for both unions and management to work toward halting the wage-price spiral which has been discouraging consumer buying. That is the view of Wm. A. McDonnell, newly elected president of the U.S. Chamber of Commerce. "In the past," he said, "recessions have been cured by price reductions. The surest way to get people back to work would be to encourage investment in new plants and equipment, as well as consumer spending through Federal tax revision." Across-the-board tax reductions, he believes, would encourage upper and middle income groups to invest in business expansion, thus creating jobs, while enabling persons in the lower-income brackets to buy more goods and services. McDonnell's over-all view on the business outlook is optimistic. He said, "There is good reason to believe that this recession may be near or even past the half-way point. Encouraging factors are: inventory reductions; easier credit; a fairly optimistic stock market; the continued high level of personal income; the increased demand by state and local governments for credit to provide schools, roads, hospitals and other community needs."

Increased spending plus tax cut threatens to boost Federal budget deficit to $10 billion, says H. J. Miller.

● According to Herbert J. Miller, executive director of Tax Foundations, Inc., the combination of Congress' going "overboard" on spending and a drop in Federal tax revenue may result in a $10 billion Federal budget deficit for the current and next fiscal years. "For the first time in our history," he said, "we are seeking to use Federal spending to support simultaneously a cold war on the international level and an economic war against recession at home. There can be no doubt that reduction of the heavy tax load is badly needed, but it should be accompanied by reduction in less essential expenditures and not come at the expense of grand-scale deficits, which have already helped halve the dollar's purchasing power." Some members of Congress, from both parties, question the wisdom of cutting taxes and thereby producing a deep deficit. They hope that the economy will turn upward under the stimulus of increased appropriations for housing, highway-building, etc. Organized labor, on the other hand, is exerting pressure for immediate tax reduction.

March industrial output is at November '54 level.

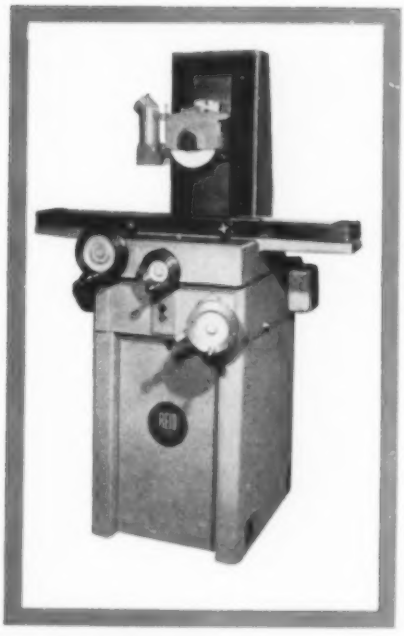
● The Federal Reserve Board's seasonally adjusted production index fell two points in March to 128% of the 1947-49 average, the lowest output since November 1954. The index has dropped about 13% since it started falling from its December 1956 high of 147. It is 12% lower than March 1957.

The durable goods industries, however, dropped less than in recent months. The seasonally adjusted index for these industries fell only two points in March, whereas February's drop amounted to five points.

The auto production index, on the other hand, declined more in March than in February. Seasonally adjusted, it stands at 92, 15 points below February and about 38% below March a year ago.

The over-all index, while the lowest in more than three years, is still five points above the 123 base index of the 1953-54 recession. White House officials, in view of the smaller March decline, believe the April index (to be released sometime in May) will drop even less.

IT'S A NEW REID 6-12



Reid's brand new 612 surface grinder is twice the weight of comparable grinders in this size. It incorporates many features heretofore unavailable on a 612 grinder. Standard model offers a timing belt-driven table and a precision anti-friction belt-driven spindle.* Complete underguard dust protection is provided as standard equipment.

Vertical work height is a full 12-½". The center distance on the cross slide ways is 18" . . . a big factor in greater stability and ruggedness. *More*, the new 612 incorporates one shot lubrication, cross slide lock and finger tip controls.

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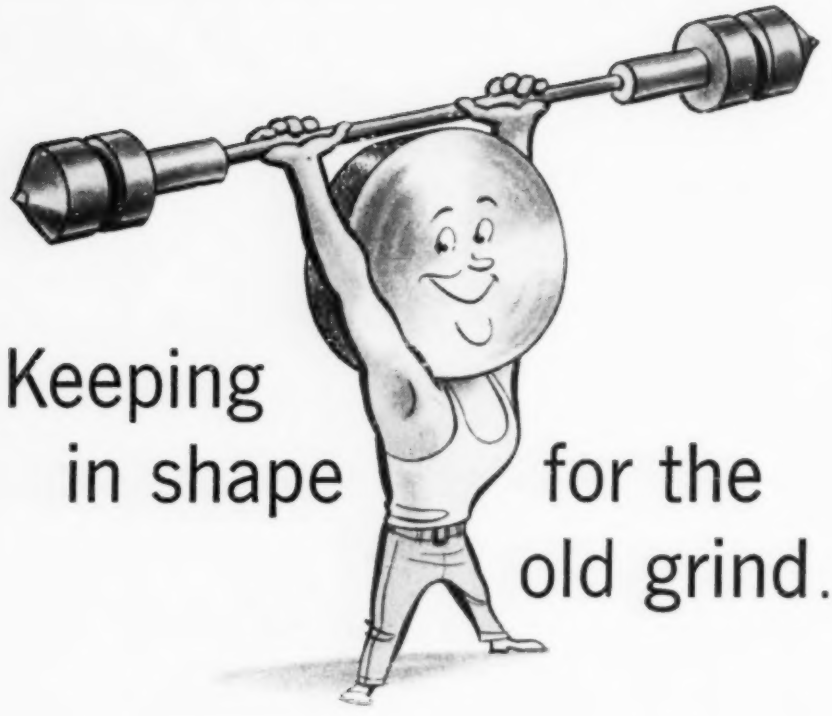

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Letter From Washington

Republicans & Democrats Discuss Future Leaders

Talk around the Capitol has former Speaker Joe Martin stepping down as Republican leader of the House after the November elections. He and other influential members of the party are said to favor a transfusion of young blood into positions of leadership.

Adlai Stevenson appears to be gaining increasing popularity as Democratic presidential candidate for 1960. Despite his defeats of 1952 and 1956, the Democrats believe he is still their strongest candidate.

President to Speak on Nation's Economy

President Eisenhower plans to speak before the American Management Association May 20 at New York City. The occasion is the annual meeting of the Association, a conference on economic mobilization.

The speech invitation followed the President's recent remark that "the real mainspring of our kind of economy is not Government, but the built-in thrust and vigor of private enterprise."

Congress Admits Need for Improved Statistics Program

National and congressional attention has become focused on the need for quicker and better business statistics through AFL-CIO President George Meany's recent request that March unemployment figures be released as soon as they are available.

Instances have been cited of times when figures were released early; i.e., September and October 1956 employment figures were made public without waiting for related Department of Labor data.

The President and the Joint Economic Committee have long urged an improved statistics program so that the public may know what is happening to the nation's economy more promptly, regularly, and accurately. Congressional majorities have been irresponsive to these demands in the past, but the current recession is showing many on Capitol Hill the need for stepping up this important service.

• • •

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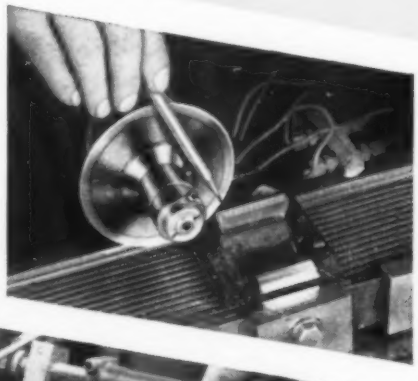

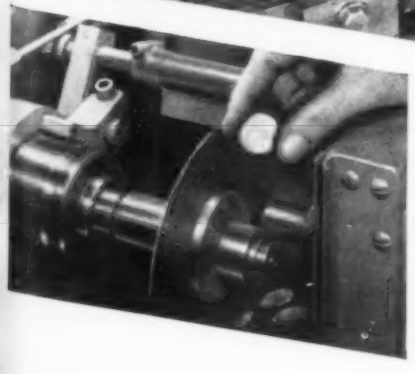

*Taken from the word microtome, defined by Webster as "An instrument for cutting very thin sections."

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This versatile machine is also ideal for precision stock removal. See the new DoALL Microtom-atic demonstrated on your own samples at the DoALL Technical Institute, Des Plaines, Illinois—or send in samples and requirements for complete report. Call your local DoALL Store, or write today for information and new literature.

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DoALL originated the leasing of machine tools. Its successful operation for many years can mean immediate savings to you. All DoALL machine tools can be leased at low rental with purchase option.

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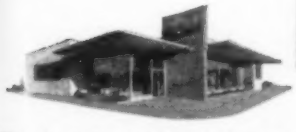

This is a Typical DoALL Store

GR-23

THE DoALL COMPANY, Des Plaines, Illinois

Red Foucault grinds roll

Louis "Red" Foucault, general foreman of the roll grinding department at Allegheny Ludlum's Wallingford Steel Co., has been a leader in the development of new roll grinding techniques for 30 odd years. Recently he has been working closely with Bay State's Fred Lee and it has really paid off for all concerned.

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WHEELS of PROGRESS

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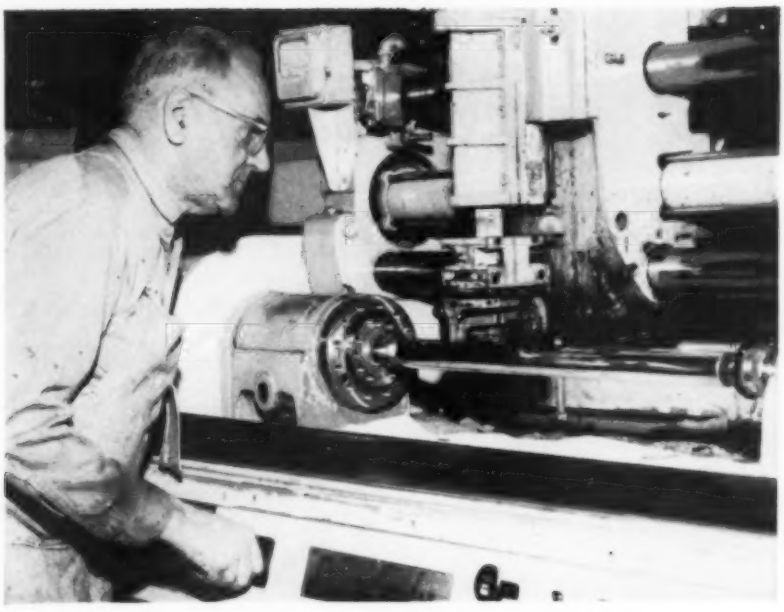


This 29⅛" x 2½" roll was rough-finished with a 600 grit Bay State honing stone. Here operator Lyman Tyler is giving it the final finish with the amazing 2600 grit stone on a Gisholt Superfinisher.

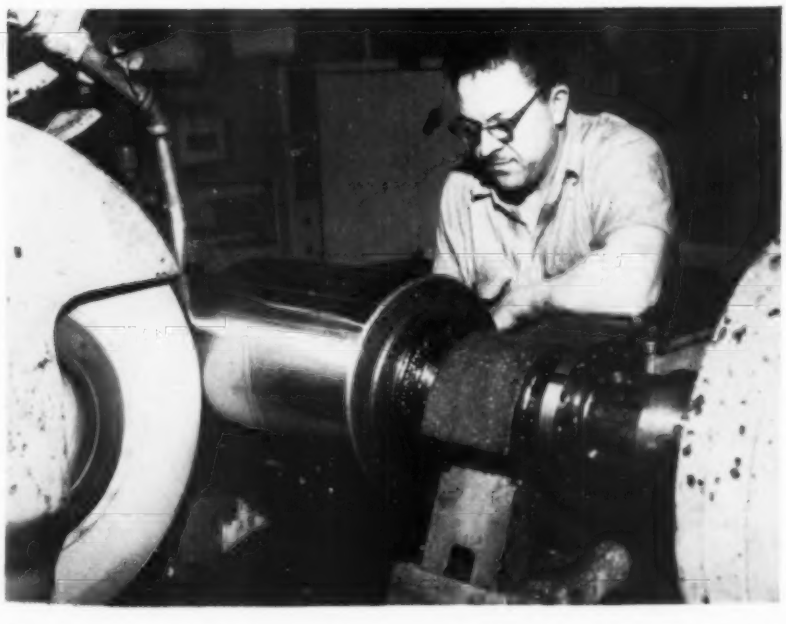
50 millionths tolerance at Wallingford Steel

It's one thing to talk about millionths when you're honing a piece of steel the size of your finger. But when you want to grind 33" strip-finishing rolls more than two feet in diameter to tolerances of 50 millionths concentricity... parallel end to end ...you get into a totally different kind of grinding.

And that's exactly what Red Foucault of Wallingford Steel did get into with Fred Lee, Manager of the Bay State Bristol (Conn.) office.

Two ten thousandths had been the closest tolerance possible until Lee came up with a 2600 grit stone that had never been tried on strip-finishing rolls before. *Result:* Rolls that are 400% closer to perfect concentricity with finishes of #1RMS or under . . . a new performance record for Red Foucault . . . and the smoothest stainless steel strip (finishes as fine as #4RMS) ever produced for manufacturers of cutlery, automobiles and what have you.

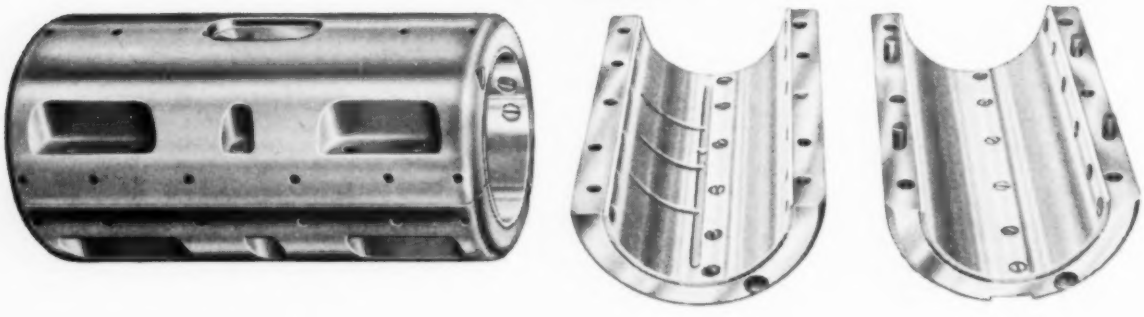
You'll find your own Bay State representative ready to go to infinite pains to help solve your particular grinding problems and, like Fred Lee, not afraid to try new techniques. *Better grinding at lower cost . . . that is his business.*



In preparation for final honing operation, operator John Bakamas gets a #1RMS finish (and under) on a 13" x 13" roll with a Bay State levigated aluminum oxide resinoid bonded wheel.

Novel Design provides *Astonishing Bearing Life*

The life of the HILL front spindle bearing on HILL horizontal spindle hydraulic surface grinders is truly astonishing. This bearing has been an *exclusive* HILL feature for more than 15 years. The necessity of replacement, under constant use, is practically unknown.



• • • The front spindle bearing on HILL horizontal spindle hydraulic surface grinders was engineered by the HILL ACME COMPANY and has proven in the field to operate indefinitely. An alloy bronze bushing is fastened to a semi-steel casting with brass screws. The bronze bushing is undercut lengthwise in four equidistant locations on the outside diameter to allow for spindle expansion. (Darker areas in photo show undercut sections.) A perfect bearing surface is established in the I.D. of the bronze directly opposite the undercut sections. Oil is forced into specially designed concave relief areas which act as oil wedges assuring long bearing life. Hardened dowel pins guide the two halves together to their original position. The bottom half of the bearing has an oil return slot shown at the edge of the half section on the outside diameter. Note that there are NO oil grooves in this bottom half or in the quarter half of the top section. The shaft rotation spreads the oil film from the oil distribution grooves to the perfect bearing surfaces. Any additional oil grooves would act as scrapers and be detrimental to the oil film formed around the spindle.

This is just one of the many exclusive construction features that result in the longer life and permanent accuracy of HILL heavy duty surface grinders. Detailed literature on these high-precision machine tools is now available.

24" x 24" x 72" HILL horizontal spindle surface grinder grinding blanking dies to extremely close tolerances. Also built in Vertical Spindle design.

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EDITORS PAGE

Your Time Is Now!

These are trying times for the metalworking industry. Whether it's automobiles or sump pumps, purchases of these items by the public appear to be retarded, with resulting dislocations all along the production line. This, alas, is the time for shelving of projects and budget slashing. It is also our time of challenge.

Usually we are so busy with the immediate problems of getting the work out and correcting sick processes and limping operations that we do not bother to investigate those operations which appear to be performing well. Therefore, in these days, when the need for cost-cutting efficiency is particularly acute, why not turn for a moment to those operations which appear to be above reproach. We refer to those milling, planing and broaching jobs which should be placed on a grinder.

It is so in industry as it is with humans: So many things are done by habit and rote they have worn a groove in our brains and we accept them as the last work of efficiency and truth. And yet it is just these two twins, Habit and Rote, who should be disinherited and uprooted. Out with them!

In the lead article on the Whirlpool Corporation in this issue several ingenious grinding set-ups are described. Several of them had been milling and broaching operations, and for years had been as inviolate as a shy maiden until somebody decided the job could be done better by grinding. A long time went by before the answer to the problems were discovered, but discovered they were, through hard work and imagination. The result has been highly worthwhile. And so is it with thousands of operations: They can be performed better, cheaper and faster by grinding. We must but look for them.

Today you can hog off ½" of metal if you feel like it, not by laboriously milling it in hours, but by grinding in minutes. If you desire, you can use the same grinder to lap the same part to 1 micro inch. Look at all of your milling, shaping, planing, broaching and turning operations and ask yourself: Can I grind it?

And so today's recession can be a challenge and carry tomorrow's reward. Remember, you don't need management's O.K. to improve an operation, don't need its O.K. to think. There is no moratorium on imagination. This is the time when Intelligence and Ingenuity are separated from Habit and Rote.

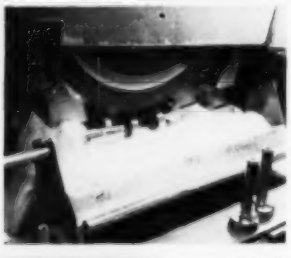
Wm. J. Schleicher

Vice President, Editorial Director
Hitchcock Publishing Co.

MAY, 1958

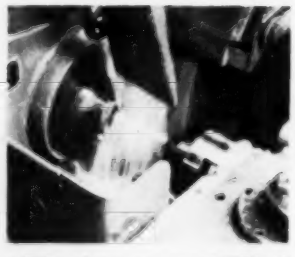
Grinding Replaces Conventional Cutting at Whirlpool Corporation

vertical spindle machine supplants angular wheel head, increases production

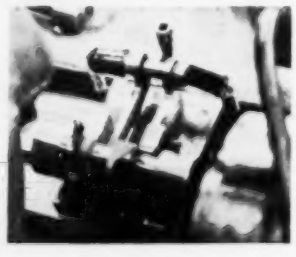


highly interesting machine solves tough slot grinding problem . . . replaces milling and broaching

solve an expensive diamond dressing problem



plunge grind to produce taper of .0001-in. in one direction . . . surface finish is 5 microinches



home made cradle holds part to maintain maximum .001-in. runout of combined head and shaft

By **Darrell Ward**
Field Editor

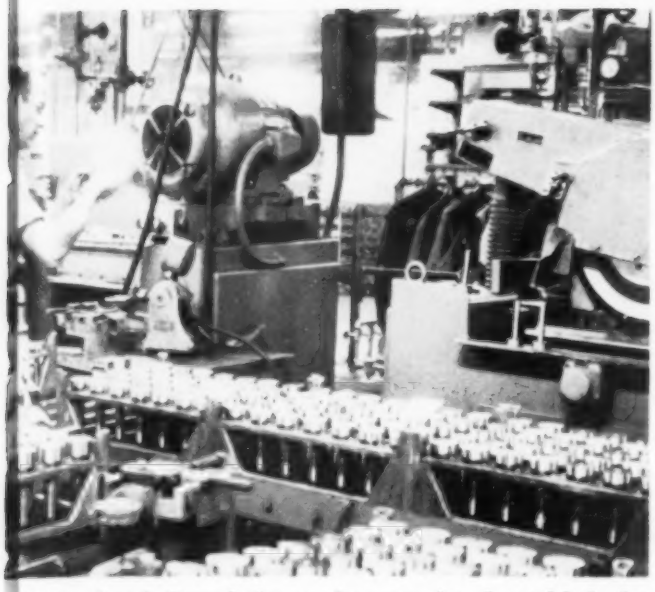
● Only a practical engineer or an operator in a modern shop can appreciate all the factors involved in making an acceptable compressor unit. When one considers a unit which has built the reputation of being tops in its class, a process or manufacturing engineer might well ask, "How do they do it?"

We asked that question at Whirlpool Corporation at Evansville, Indiana, where we were shown all the grinding operations. One of the first machining operations on the rotor, for instance, was not milled in the usual manner, but rough ground instead.

The rotor, one of the only three moving parts in the compressor, is simply a ⅝-in. shaft about 4-in. long with a ⅝-in. head 1⅝-in. in diameter. The head has two opposing ⅛-in. slots to accommodate blades or vanes which slide outward against the cylinder wall by centrifugal force. The rotor is located off center in the cylinder with close tolerance running clearance away from one portion of the cylinder wall. The vanes sweep the inside face of the cylinder, sliding freely in the rotor slots, but fitted closely enough to seal the moving surfaces against refrigerant or lubricant leakage. This kind of operation, which will be sealed forever once it is assembled, requires close tolerance production of all ground surfaces and precision assembly.

The rotor is made from an annealed forging of dense, close grain semi-steel which is more economical and produces better quality than can be obtained from bar stock. The part is brought to shape by automatic lathe operations. The shaft is rough ground and thread rolled to make the oil grooves. Then, it is reground on a Cincinnati No. 2 centerless to remove the shoulder pushed up by the thread rolling. The shaft at this point is .634-in., plus-or-minus .0005-in.

A semi-automatic boring setup produces the necessary holes, end centers and an oil slot on the outer face



of the head. Two holes in the rotor head establish the bottom of the vane slots. A minor broaching step brings these holes to close tolerance relationship with the axis of the shaft. The inside face of these holes becomes the inside radii of the vane slots after the slots are cut. These radii are broached to a tolerance of .001-in. in their specified distance out from the center of the rotor shaft.

Substitute Grinding for Milling

The vane slots were, at one time, milled or broached. But milling and broaching both were slow and expensive.

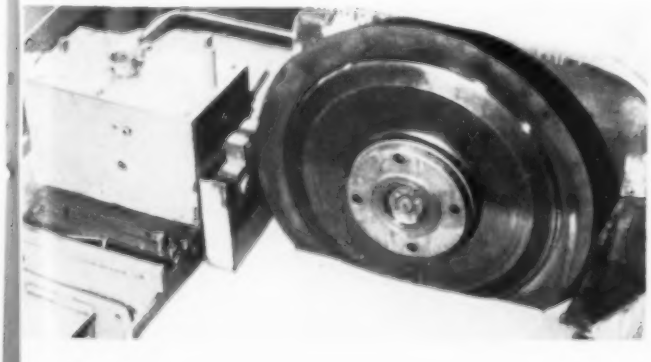
What about plunge grinding the slots? Rubber bonded cutoff wheels were being used for the finish grinding of these slots at a later step in production; why not use what was left of these wheels to open up the slots before the wheels are thrown away.

The shop tried rough cutting on the slots with used cutoff wheels and it proved to be a fast and economical method.

The interesting feature of this rough grinding of slots instead of milling or broaching extends beyond the mere fact that grinding replaces a former machine operation of another sort. The important fact is that the cutting tool cost also has been eliminated! Here's how:

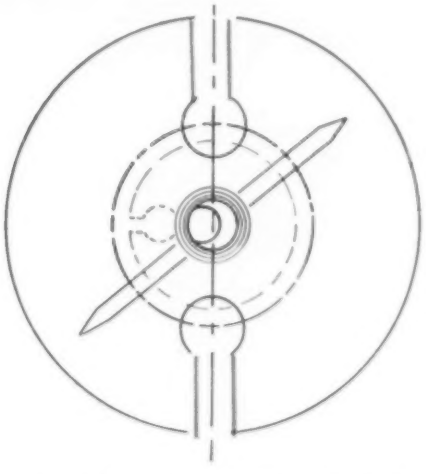
A Raybestos-Manhattan A1 2840 grade 465 latex rubber bonded cutoff wheel in a 16-in. x .148/.154-in.

9. Rubber bonded cutoff wheels are faced on this special built beefed-up machine with new type oriented crystal diamonds precisely centered.



7. (left): Finish grinding of the rotor slots is done on special machines developed by Whirlpool.

8. (top): Slots on two rotors are ground simultaneously in one plunge of a latex rubber bonded cutoff wheel. Parts are cradled in carbide inserted V-blocks with clamping fingers above.

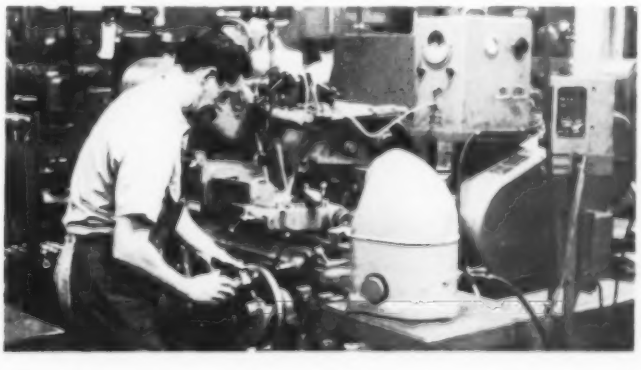


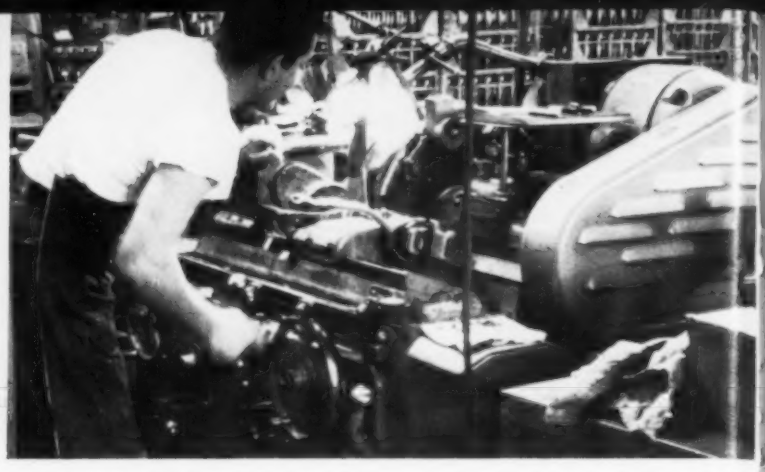
Slots shown in red were milled. Rough grind and finish grind with same wheel.

x 7-in. diameter is used for the finish grind in the slots. The wheel is diamond dressed to a thickness of .138-in. plus-or-minus .0015-in. When the wheel has broken down below tolerance limits for the finish grind, it goes back to the wheel man who dresses it again to a thickness of .125-in. to .128-in. Then, it becomes a rough grind wheel for cutting the slots.

When it has broken down further as a rough grind wheel of 16-in. diameter, it goes to the wheel man a third time for cutting down to 14-in. diameter and first dressing as a finish grinding wheel. It is used

10. Rotor shaft bearings are finish ground on a 6 x 18 Norton with both manual and electronic controls tied to in-process air gaging.





1. (left): Rotor slots are rough cut with latex rubber bonded cutoff wheel previously used for finish grinding to completely eliminate cutting tool costs.

2. (right): Semi-finish grinding of the rotor shaft bearing surface on a 6 x 18 Norton cylindrical grinder.

Part supported on centers for grinding; rotor bearings shown in yellow.

a second time then as a finish wheel and a second time as a rough wheel at 14-in. diameter before it is finally discarded.

In this rough grinding of the slots, which has eliminated milling, the cutoff wheel is operated at 2350 rpm and down-fed by a hydraulic cylinder operating in interrupted impulses. It plunges the wheel into the work about .010-in. to .015-in., then backs off .004-in. to .005-in. to permit a free flow of coolant in the cut, and instantly plunges again. This interrupted down feed continues throughout the cycle, at a total rate of 2-in. per minute, cutting and cooling, until the full depth of the vane slot is obtained in the approximately ⅝-in. thickness of metal. Normal production averages about 145 parts per hour. The wheel is dressed every 10-15 parts, figure 1.

Soluble oil coolant, mixed 1:50, is used on this and all other rough grind and semi-finish grind operations. No special water treatment is required. The coolant is recirculated without filtering. Machines are cleaned up and fresh coolant is replaced at the end of each shift. Synthetic coolants are used in the finish grinds.

Four Grinds Obtained Instead of a Previous Two

By utilizing the original cutoff wheel at two diameters on the finish grind and at the same two diameters in between on the rough grind, four grinds are obtained from a wheel normally capable of only two. That is why the plant can, for practical consideration, assume that the rough cutting of the slots with an abrasive eliminates all cutting tool costs.

But, another problem occurred. If the heat treated part was produced in a typical sequence of operations, the grinding of the slot after heat treatment opened up soft metal deep inside the rotor head. And, the rotor had not been specified at an ideal hardness anyway because of previous milling and broaching practice.

This problem was overcome by rough grinding the slots before heat treating. Now, the entire rotor, including all of the surfaces deep in the vane slots, is easily heat treated to bring the part to a Rockwell 59-63 C.

Heat treating after rough grinding of the slots permits better penetration down into these vital wear surfaces which were not uniformly hardened when they were first cut after heat treatment.

Subsequent operations, except for finish grinding of the rotor head, are performed with the part supported on centers. For that reason, the rotor centers are lapped on an Ex-Cell-O center lapping machine to remove the scale left by heat treating.

Norton 6 x 18 cylindrical grinders semi-finish grind the rotor bearings, figure 2. These are the two wear surfaces, one about ⅝-in. long next to the head and the other about ⅝-in. long one inch back from the tail, which are most critical in the shaft design. The semi-finish grind only removes enough metal to correct distortion from heat treating and bring the rotor shaft back to shape for the finish operations. At this point, .005-in. metal is removed, sizing the shaft to .627-in. plus-or-minus .00025-in. That leaves .002-in. for finish grinding.

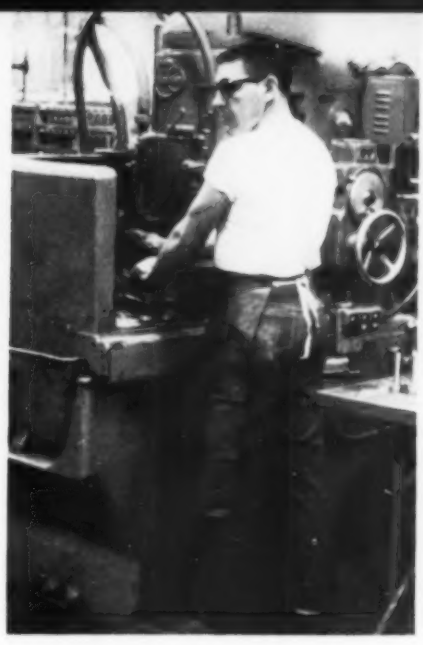
The wheel is a Carborundum A465-N5-V30, size 20 x 4 x 12, run at 1020 rpm with a down feed of .0015-in. per minute. Production rate is 140 parts per hour. Wheel is dressed every 50 parts.

Brazed carbide tip centers support the rotor in this and subsequent steps in which the part is presented to the wheel in a horizontal position—with the one exception mentioned.

Caliper type air gages and indicators measure the diameter of the shaft as it is ground. Operator checks each piece as removed from the machine, figure 3.

Speed Grinding With Vertical Spindle Machine

Semi-finish grinding of the outside face of the rotor head is an entirely different kind of operation. Here, production rate is 360 parts per hour because 24 pieces are chucked in a vertical fixture and ground on a No. 11 Blanchard. Carbide inserts are used for supports



3. (left): Gaging in process enables operator to bring shaft diameter to .627", leaving .002" for finish grinding later.

4. (center): Semi-finish grinding of outside face of rotor head is done on a No. 11 Blanchard, found to be much faster than other machines.

5. (top): Carbide inserts are hand lapped in this chucking fixture to make the rotor shaft vertical to the grinder table.

in this chucking fixture, each being hand lapped vertical to the grinder table surface, figure 4 and 5.

Here, a Norton 32A46-HAVG wheel, size 11 x 5 x 9 is down fed .046-in. per minute at 1160 rpm. No wheel dressing is required.

The Blanchard was chosen because it was found to be much faster than other machines considered. And, for some years, the company had ground the outside face of the rotor on an angular wheel grinder. But the rotor is so hard there was considerable surface fracturing from pressure and heat. The combination of metal hardness, heat and continuous pressure against the wheel did not permit sufficient cooling of the contact area. After an adequate fixture was designed to hold the parts, the Blanchard performed more satisfactorily at a faster rate. The operation is not for sizing but merely to clean up the metal and develop ultimate flatness.

The inside face of the rotor head is semi-finish ground on a 6 x 18 Landis angular wheel grinder with a 20 x 1 x 8 Norton 19-A60 J5VG wheel supplied with a dressed 30° angle face. In this case, a 30° approach angle is necessary for sizing the inside face of the rotor head down to the relief at the junction with the shaft, figure 6. Stock removal is not critical, varying from .005" to .015". Wheel speed is 1200 rpm, with a feed rate of approximately .025-in. per minute. Production rate is 160 parts per hour and the wheel is dressed every 90 parts.

Interesting Machine For Finish Grinding

Finish grinding of the rotor slots carries a little interesting history behind the whole technique and setup for this operation. The machine, itself, was developed by one of the Whirlpool engineers back in the late 1930's.

The reason the idea occurred to him was because of the prohibitive cost of putting vane slots in the rotors by a combination of operations. This engineer dreamed of some day grinding only and grinding direct to the fine tolerance that is obtained today.

He took an old No. 5 Brown & Sharpe surface grinder and cut off the top to make a hydraulically controlled head that would move up and down. In about 1944 or 1945, he came up with a working model of a special machine which actually could grind the slots, even though it was full of bugs.

The company tried to interest machine tool builders in building special machines of this type. The machine builders, however, did not think it was possible. They said that to grind direct to such a depth in this metal and to the tolerance required was fantastic.

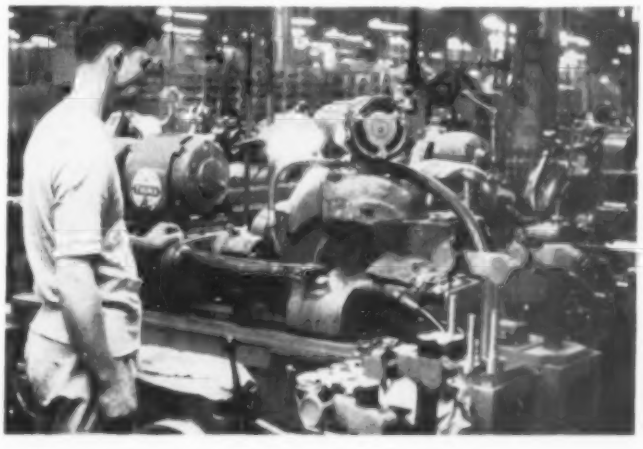
Finally, a small tool company in Indianapolis was intrigued by the idea and decided to try building the machine. This was done, but it was the beginning of more trouble than anyone had anticipated. A common occurrence in the shop was to find the machine shut down with trouble more often than it was operating. They had faith in the idea and believed it would become practical.

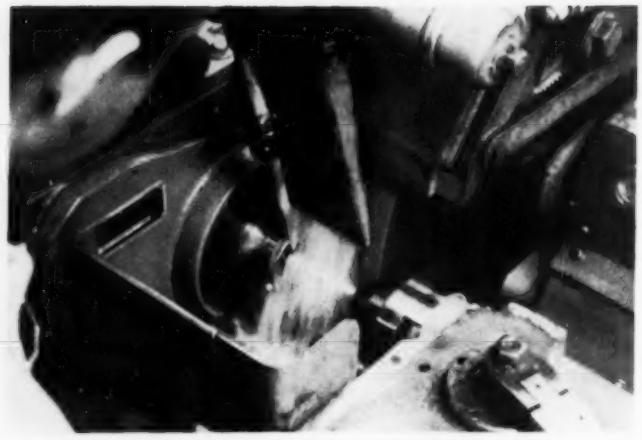
By 1952, Whirlpool felt they were 'getting by' with the setup.

An engineering firm from Cincinnati was hired to come in and study the process as it was being used to determine how it could be improved to make it trouble free.

They did. Now, Whirlpool, who owns all rights to the design, is proudly doing an efficient job of slot

6. Semi-finish grinding of the inside face of the rotor head requires angle head approach of 30°.





11. Remarkable feature of finish grinding of shaft bearings is that a straight plunge is taken, with no reciprocating action of the wheel, to produce maximum taper of .0001" in only one direction with a surface finish of 5 micro-inches rms.

Grinding at Whirlpool

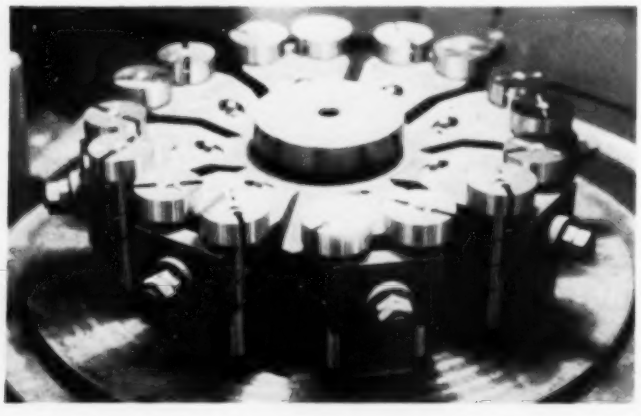
grinding on slot grinders made by the Planet Engineering Company, figure 7.

We were told that two other companies have built machines which perform a somewhat similar function, but the finish does not compare with the Whirlpool machine. The latter was designed for a finish tolerance of 5 micro-inches rms, but in practice will produce better than 3 and sometimes as good as 1 rms.

This extra fine finish on a Rockwell 59-60 C hardened metal is one of the factors which contributes to an infinitely long life for the rotor and the pump vanes which ride in the rotor slots for decades after a compressor unit is hermetically sealed.

While this development was extremely costly over a long period of time, the company feels it was well worth the effort and determination demanded of those who first thought the idea was feasible. Before the slots were cut with a grinding wheel, the milling and broaching operations actually were more costly and did not produce anything like the kind of finish now being produced. On top of this, there was what appeared to be a small tool room devoted to nothing more than servicing the broaching machines and blades

12. A V-block fixture with carbide inserts, each individually hand lapped after setup, holds 16 rotors for finish grinding outside face on Heald 221.



used in rotor slot cutting. Now, the metal can be made considerably harder and more uniform in hardness since no cutting is done in the slots.

Fixturing Important in Slot Grinding

Besides developing a special machine to handle the finish grinding of the rotor slots, the shop also had to provide special fixturing to hold the rotor in alignment. The rotor sits at an angle to the table so that two parts are ground in one plunge, figure 8. The wheel must plunge deep enough to clear the flat sides of the slot and penetrate the free area of the holes which develop the bottom radius of the slot. The two rotors being ground simultaneously are held at angles which align their axes tangent to the periphery of the wheel.

The fixture cradles are 90° V-shaped troughs with carbide inserts to cradle the shaft of the rotor. A carbide locating finger aligns the rough ground slot and then retracts as hydraulic clamps hold the part and the grinding head down feeds into the slot.

These fixtures have a normal life of 10,000 parts, after which the carbide inserts are relapped. After lapping, the machine can be adjusted to compensate for the slight wear on the inserts. The inserts are replaced only once a year, unless there should be some kind of accident.

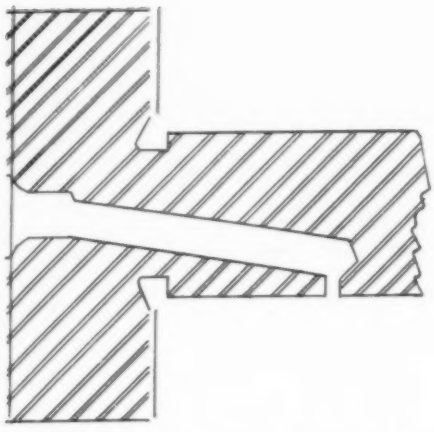
In this finish grind, the wheel is run at a constant speed of 1275 rpm with down feed taking 20 seconds for that ½-in. plunge. Metal removed on each of the two sides of the slot is approximately .007-in. on 140 parts per hour. While this may seem to be a large amount of metal removal for the finish grind, it has been found that such deep cutting with the rubber bonded wheel is similar to factors involved in other kinds of cutting tools.

In this instance, it is necessary to bite into the base metal below the hardened surface in order to get uniform cutting and longer wheel life. The deep cut eliminates much of the wheel loading that occurs in a skim cut on a similar surface.

A total tolerance of .0001-in. is maintained in the finished rotor slot. This is a total indicator reading and is maximum for parallelism and squareness.

The width of the slot, however, is not as critical since the vanes which fit the slot are selectively fitted to the proper allowance. The company hopes to develop closer tolerance in slot width in order to economize on the inventory of different thickness vanes, as well as the many steps now employed in assembly where selectively fitted vanes must be kept with their matching slots and carefully protected from contamination from the time they leave the sorting bench in an air conditioned room until the pump becomes a working mechanism inside the sealed compressor unit.

Development of the special slot grinder and chucking fixture was only part of the over-all problem in working this "dream method" of grinding slots. Wheel dressing of the latex rubber bonded wheel must be done on a special dressing machine developed by Planet Engineering. This machine is rather "beefed up" for a machine of its size in order to utilize the natural rigidity of the dressing tools. Only by beefing



Outside face and inside face are both ground with special fixtures.

up the spindle and the dressing tool holders could the shop produce a face on the wheel square enough to hold the specified tolerance in the slot faces, figure 9.

Diamond Dressing Problem Solved

Formerly, the plant used an excessive number of diamond dressing tools. These were made with a chip diamond mounted in a threaded holder. Some were good, some not so good. There were times when over 200 of these diamond dressers were used in one month. At over $5 each, this was a problem.

When this problem was discussed with the diamond suppliers, they suggested a switch to the oriented crystal type dresser. Tests on the new dresser resulted in noticeable improvements in dressing. The most obvious feature noticed at Whirlpool was that the point of the oriented crystal always seemed to be better located on center.

This observation led to more thinking. If the dresser did a better job and the diamond point was centered better, then why not bring the point to dead center to see if that would improve the action still more?

Dressers were sent to the tool and cutter grinding department where the new crystals were lapped to a 90° included angle on dead center. When these tools were put back into the wheel dressing machine, the results became fantastic immediately. The dresser had been cutting 5 or 6 wheels before a diamond was worn down. Now, the volume suddenly jumped to 25 or 30 wheels between relappings of the new oriented and centered crystal.

Investigation showed that the sharp increases in the number of dressings came from the action of the dressing tools cutting simultaneously on opposite sides of the flexible wheel. The rubber bonded wheel would tend to meander slightly when these opposing dresser points were off center. Dead centering not only eliminated this difficulty in truing the wheel, but also decreased the excessive wear on the diamond points.

However, there was still a considerable expense in lapping crystal points in the shop. The diamond tool suppliers were consulted and their reply was, "We can lap the points for you at a fraction of what it costs you to do it in your own shop."

Whirlpool now pays a little over $7 for a new dressing tool, lapped to dead center on a 90° point. This tool consistently averages better than 20 wheel dressings before it needs to be relapped, instead of the former $5 tools which averaged about 5 wheels for each relapping. The new tool is relapped by the diamond tool suppliers at $1.25 each and can be relapped 3 or 4 times during their useful life.

The wheel is dressed every 75 parts in finish grinding to a flat face ½-in. in from the periphery, then tapered thinner to a relief running about 1-in. further for a total dressing of 1½-in. The flat is the actual cutting face. The relief eliminates irregularities that might develop in the rotor slot from whipping action in the wheel.

This wheel is dressed at 300 rpm with feed rate regulated to take the total 1½-in. depth of cut, on both sides simultaneously, in about 1 minute. Approximately .0005-in. of material is removed.

The dressed thickness on the grinding face of the wheel is .1385-in., checked by air gage before it is removed from the dressing machine.

Next comes the finish grind on the rotor shaft bearings. This is done on a Norton 6 x 18 semi-automatic grinder, controlled either manually or by a Pratt & Whitney air gage actuated electronic control. There is an interesting feature in the adaptation of this particular control to meet the special conditions at Whirlpool.

Interesting Control Feature on Finish Grinding

Basically, the electronic control permits fast feed up to a specified point. Then, it kicks into slow feed for a predetermined dwell time for spark out. Standard practice with the equipment suppliers was to permit a specified dwell time computed for the amount of metal to be removed.

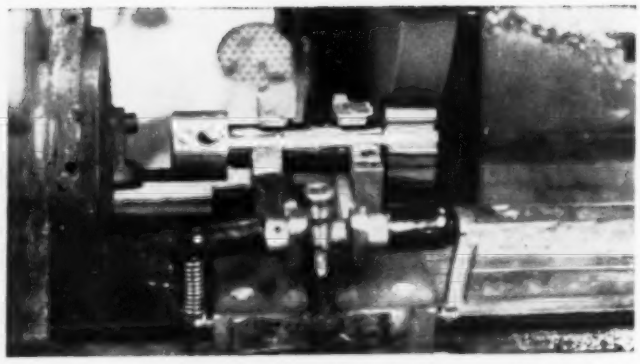
Whirlpool didn't want that. They said that instead of dwelling for something like 10 seconds for spark out to get that last .0001-in. of metal as calculated, they wanted to arrive at the specified diameter during spark out and have the control back off immediately, whether it took 8 seconds or 12 seconds to remove the final skin of metal. That is why the combination of air gage and electronic control was developed for this operation.

The objective was to grind to one-half specified tolerance or closer. Specifications call for a tolerance of .0002-in. The shop wanted to grind 100% within this tolerance by making the machine consistently grind to .0001-in. for normal operation.

The remarkable feature is that this is a plunge grind, not a reciprocating action of the wheel. Yet, the bearing surfaces being finished are held to a 5 micro-inch rms with a maximum taper of .001-in. in one direction only, figure 10 and 11.

The wheel is a 24 x 4 x 12 Norton 57A100 K6 VBE, operated at 1000 rpm and fed at .0045-in. per minute. Production rate is 128 parts per hour. The wheel is dressed every 105 parts.

Next is the finish grind on the outside face of the rotor head. This is done on a Heald 221. A multiple fixture holds 16 rotors for simultaneous grinding. This is a V-block type of fixture with carbide inserts, figure 12. The inserts are hand lapped to hold the parts square



13. Finish grinding of rotor head O.D. is done on a Brown & Sharpe No. 5. Part is rotated by dogging attachment on tail of shaft to prevent marring of any other surface.

to the table. If the fixture should become worn or disturbed for any reason, the machine operator shuts down and a tool maker relaps the wear surfaces for trueness before the operation is resumed. The fixture is never permitted to be disturbed if possible, or removed from the machine. It takes an estimated 5 to 10 minutes to lap one position in this fixture. Usually, 2 or 3 positions per week will require lapping.

This setup utilizes a 14 x 1 x 5 Carborundum DA80 J6 V10 wheel operated at 1000 rpm with down feed at .0002-in. per minute. Stock removal is .002 to .003-in. Finish is 5 micro-inches rms. Maximum concavity permits .0001-in., but no convexity is permitted. The outside face of the rotor must be square to the axis of the shaft within .0001-in. total indicator reading. Production rate is 100 per hour per machine, with one man operating two machines. The wheel is dressed every 105 parts.

A synthetic coolant is used in this machine for a period of 32 operating hours, then the entire machine is cleaned up and recharged with fresh coolant. No filtering is used at present.

Finish Grinding Utilizes Special Table

Finish grinding on the inside face of the rotor head presents an entirely different approach and illustrates some typical features of Whirlpool engineering thinking. This operation is performed on a Landis angular wheel grinder which mounts a 24 x 1 x 12 Norton 19A100 I12 VBEP wheel supplied with a 30° angle face. The wheel is run at 1050 rpm with a slow infeed of .008-in. per minute.

This machine has a provision for adjusting the table, installed as a special accessory for Whirlpool. The order demanded some kind of fine thread cross-feed screw or micrometer cross-feed adjustment for setting the table. The machine finally carried a cross-feed adjustment with a 5-in. barrel micrometer type of dial which reads in .0001-in. But, Whirlpool wanted something even more positive than this. They wanted an indicator dial to give a positive reading of true relative movement between table and ways. This came in the form of a large 5-in. dial which can be read easily by the operator without relying on the micrometer barrel which may develop backlash.

Only .002-in. of material is removed, so the micrometer adjustment was desired for better control. The relief at the junction of the inside face of the rotor with the shaft is a rather small area for the edge of the angle-faced wheel to enter. So, instead of feeding into the work for the full cut, the wheel is fed far enough to let the acute edge penetrate the relief, then the work is cross-fed against the wheel with the micrometer adjustment.

The micrometer adjustment on this grinder is an added advantage in that the operator can continuously compensate for wheel wear. When he removes a part from the machine and checks it on the gage, he can immediately detect any "growth" in the size of the part. He makes a mental note of how much the cross-feed should be moved over and makes such an adjustment for the next part. He knows from experience and observation how much to move the micrometer to compensate for a given amount of oversize on the part or wheel breakdown. Meanwhile, the infeed stop for the wheel can remain set until the wheel needs redressing.

The wheel is dressed with a wheel guard dresser after every 105 parts. Production rate is 140 parts per hour. Tolerance demands .0001-in. in flatness and in parallelism between inside face and outside face of the rotor head.

It was interesting to note that this operation could have been automated, in the opinion of the engineers, except for the economics of automation. It was estimated that automation in this instance would cost $20,000. Normal production ranges from 600,000 to 700,000 parts per year, but the problem is that there is no way of knowing what changes might be made in a year or two which could obsolete the entire automated setup.

Expensive Cradling of Part

Finish grinding of the rotor head outside diameter employed what we assumed to be an extraordinarily costly setup until the situation was fully explored. This operation is performed in a homemade cradle that is estimated to have cost about $2,000, figure 13. The cradle supports the rotor on its shaft bearing surfaces with carbide insert supports. Four of these cradles are kept in operation while two spares are kept ready for emergency.

The reason for this costly tooling is, again, to produce the close tolerance required in the final unit. If the part were ground on its centers and there should be a bearing runout of the allowable .0001-in., occasionally there could be the same amount of runout on the rotor head O.D. on exactly the opposite side of the centers. This would result in a total runout between shaft and head O.D. of .0002-in. That would be cause for a reject on the rotor.

The cradle chucking of the rotor shaft has been the only solution to the problem, in spite of the fact that the company would like to avoid the expense and maintenance of the cradles. The carbide inserts in these cradles must be ground and lapped before they are installed on the grinder. Then, after installation, they are additionally hand lapped in position to bring them into final tolerance for grinding and also to eliminate any chance of marring the shaft bearing surfaces.

An odd feature of the engineering on this part is that while a total of .002-in. of metal is removed, the actual O.D. of the rotor head has a diametrical tolerance of .001-in. The question arises, why worry about eccentricity between shaft and head O.D. of .0002-in. when the diameter, itself, can vary five times as much?

The answer lies in the assembly of a compressor unit. Regardless of the specific O.D. of the rotor head, its face is brought into close contact with the cylinder in which it rides off center. Whatever the O.D., the head is set not more than .0001-in. away from the cylinder wall at the closest point. This spacing acts as a seal and must not be made to vary (in rotor head runout) enough on the loose side to permit escapement of compressor gas, nor enough on the right side to make metal to metal contact between rotor and cylinder.

This assembly is located with electric gages set to permit a free running fit between rotor head and cylinder up to a maximum allowance of .0001-in. Therefore, maximum eccentricity between rotor head and shaft must be limited to plus-or-minus .00005-in., or a total tolerance of .0001-in. combined head and shaft runout.

That is why the finish grinding of the rotor head O.D. is done on a carbide insert cradle which supports the shaft bearings instead of the part being chucked on shaft centers.

The operation is done on a Brown & Sharpe No. 5 with a 14 x 1 x 5 Norton 19A80 05VB wheel run at 1620 rpm. The finish is held to a 10- to 12 micro-inch rms. Production rate is 160 parts per hour. The wheel is dressed after 125 parts.

After all finish grinding operations are completed, the reliefs cut into the shaft below bearing surface are ground on a two-wheel setup. One relief merely reduces contact area between the two remaining bearing surfaces, while the relief out on the tail end of the shaft is made for press fitting to the motor armature.

The press fit diameter must be concentric to the shaft bearing with .0002-in., because the 4-in. diameter armature is held to a tolerance of .0002-in. in concentricity. This is for adequate air gap clearance between armature and stator which allows .006-in. or less air space. Excessive runout in the armature and rotor shaft would affect both mechanical and electrical properties of the motor. Neither of the two reliefs, however, call for a critical finish.

The relief grinding is done on a 6 x 12 Norton cylindrical grinder. In the past, the wheel was a 19A60 L5 BG, but the company will be using a 57A100 K6VBE when the supply of the former wheels is exhausted. It has been found that the newer wheel gives considerably longer wheel life.

Two wheels are mounted on the shaft with a spacer between them to skip the inner bearing surface. They are run at 1000 rpm and in-fed .008-in. per minute. Stock removal totals .010-in., plus-or-minus .0001-in. for the armature fit and approximately .005-in. relief between bearings with no tolerance specified. Production is 160 parts per hour. Wheels are dressed after 125 parts.

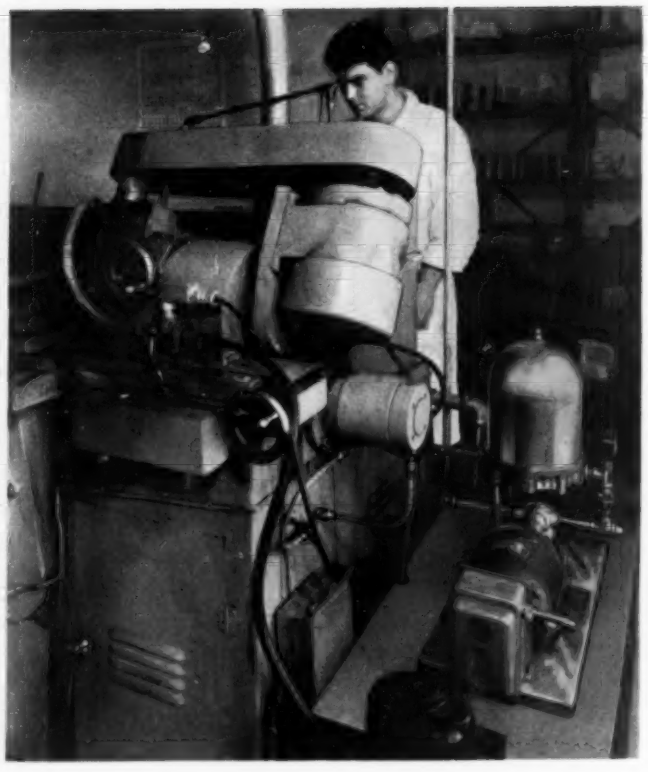
Automatic sizing is obtained by air gaging and electronic controls, because a former setup produced numerous rejects on the armature fit. Originally, it was found that the infeed stop would not hold the tolerance required because a particle of dirt or grit might stop the wheel from feeding to the full depth. The automatic size control is limited only by the accuracy of the air gage feelers. And, as it was pointed out to us on the job, if the wheel should cut a little faster or slower than normal, this makes no difference. When the shaft relief is brought to proper size, the control kicks the wheel back automatically, without regard for feed, speed, or sparkout time.

Finally, the rotor is Rotofinished on a Rotomatic to remove burrs and improve the surfaces. In earlier years, 15 to 20 people were employed to break all corners by hand, hone the edges, and improve the finish on the critical surfaces. Now, the Rotofinish machine easily removes all the burrs and reduces the 5 to 6 micro-inch finish from the grinding line down to a 2½ to 3 micro-inch rms before assembly.

A No. 16 grain Coruloy "A" chips in No. 610-C compound was designed by the supplier for this operation. Plain water is used with the abrasive. No inhibitor or detergent is added. As the parts are removed, they are blown clean with an air hose and dipped in a rust inhibitor. The Rotomatic produces in excess of 200 parts per hour.

From there, the rotors move to an air-conditioned department where they are matched up with selectively fitted vanes which ride in the rotor head slots. Production of these precision vanes and other close tolerance parts for the pump leads to another article in the future. • • •

14. Rotofinishing deburrs and improves finish down to as fine as 2½ to 3 microinches rms at the rate of more than 200 parts per hour.



Full flow method of coolant cleaning is shown here as applied to a single machine. This Alsop Sealed Disc Filter takes the dirty coolant from one side of the tank and discharges filtered coolant on the other.

Part III

Installation of Coolant Cleaning Equipment

by **Arthur L. Wilson**
Filtration Engineer
Barnes Drill Co.

● The success of the application of a selected piece of coolant cleaning equipment greatly depends on the method of installation of the equipment. The proper time to consider this problem is when you are selecting your coolant cleaning equipment, not after it is purchased. This method of installation should be considered when you are selecting your coolant cleaning equipment because it may be that you wish to have a gravity flow from a machine and the equipment you are considering is of such a physical dimension that it will not permit this flow by gravity. Therefore, be sure that in making the choice of equipment, that as much consideration be given the installation as in the selection of the equipment on the basis of the job to be done.

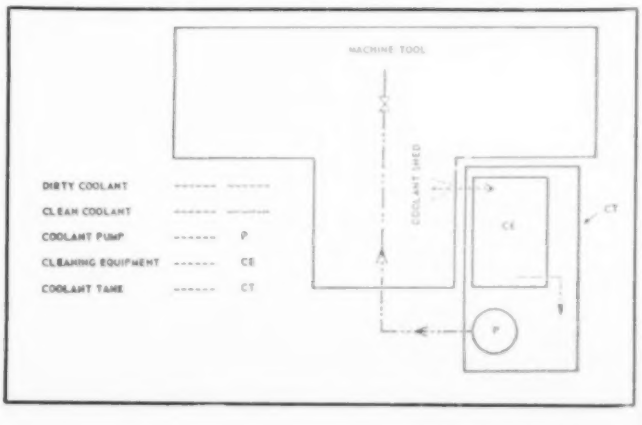
In general, coolant cleaning equipment may be installed in four distinct methods. These are:

1. Full flow Installations
2. Bypass Installations
3. Combination Full Flow Bypass Installations
4. Batch Type Installations

The full flow method (see sketch I), as the name implies, is that usually applied where the piece of coolant cleaning equipment must handle the complete coolant flow and contaminant load as the contaminant load is produced and the pump delivers the liquid. The use of the full flow method of installation necessitates choosing a piece of coolant cleaning equipment of ample capacity to handle this contaminant and coolant load as they are presented within the length of time allowed for treatment of the coolant and load. This latter point is reflected in the capacity of the piece of equipment; therefore, as previously mentioned, it is essential that you select this piece of coolant cleaning equipment for full flow installation on the basis of the maximum coolant flow that you will attain from the grinding or finishing machine in a pre-determined period of time. You must make certain that once you have chosen the efficiency that you desire in a piece of coolant cleaning equipment when operated with the maximum flow of a machine, this equipment is of ample size to take the complete flow and yet keep the efficiency up to standards that you have set.

To illustrate the above point, we might cite an application where an area type filter of the automatically replaceable and expendable medium type is chosen. If this filter is selected on the basis of a 92% cleaning efficiency and for a flow rate of

FULL FLOW SYSTEM

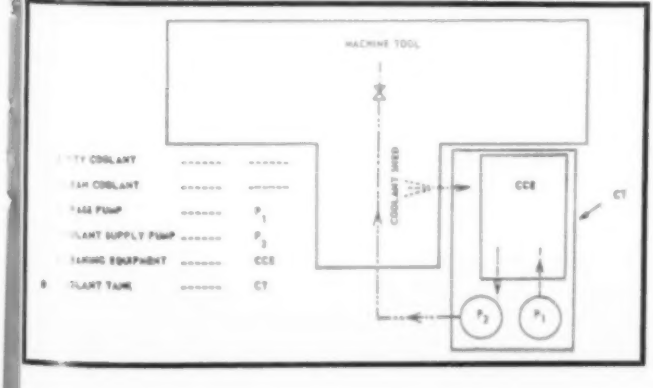


20 GPM of water soluble oil, the machine tool should never produce more than 20 GPM of coolant because the fabric consumption on this type of equipment will increase greatly, even to the point of the filter's overflowing. Usually, you can choose a more open filtering medium to get the increased flow requirements but you sacrifice the cleaning efficiency of the coolant cleaning equipment by doing so. If the selection of a piece of equipment had been made for 30 GPM on a 93% efficiency basis, instead of 20 GPM at 93%, the coolant cleaning equipment will probably have been ample for the job and a sacrifice of coolant cleaning efficiency would not have to be made.

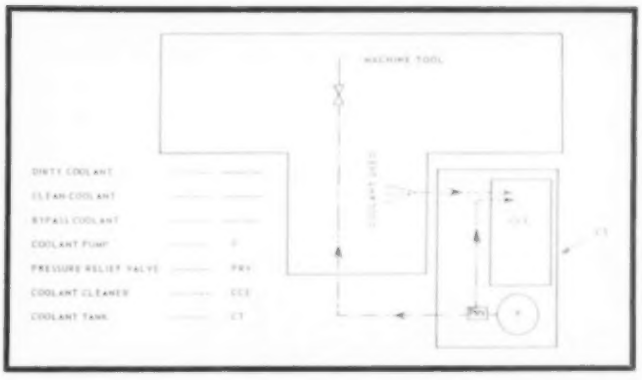
With the full flow method of installation, you maintain a coolant that is as clean as the efficiency of the piece of coolant cleaning equipment will permit. Of course, you go beyond this basic efficiency by the fact that you will recirculate some of the particles that pass through the piece of coolant cleaning equipment and may catch them on the second or subsequent passage through the equipment. This type of an installation, the full flow method, may be applied either to the individual machine or the central system. The individual installation utilizes the principle of one piece of coolant cleaning equipment for one machine tool. The central system method of installation utilizes one large piece of coolant cleaning equipment to handle one entire group of machine tools.

The individual installation is usually desirable where there is a possibility of future relocation of machine tools due to changes in processing or products. This type of installation also permits you to use a variety of coolant for the various machines of a department. Individual installations are particularly useful where a strong quality control department is evident and if there is a machine operation where difficulty in obtaining finish requirements is encountered. If you desire to either change the grinding coolant or the degree of cleanliness of the coolant, the individual installation will permit this. It is much easier to isolate these quality control problems with machine tools having individual installation of coolant cleaning equipment than it is with a central system. For this reason, the individual installation

BYPASS SYSTEM



COMBINATION FULL FLOW & BYPASS SYSTEM



of coolant cleaning equipment on "tool room" machines is usually the rule, rather than the exception.

Central coolant systems are particularly desirable where a large group of similar machines are found in one general area. If all these machine tools are capable of using the same type and concentration of coolant and if the coolant cleaning efficiency requirements on all the machine tools is not exceedingly high, central coolant systems will usually be found to solve some of the space and cost problems for supplying clean coolant to each of these machines. Usually, a lined sump is constructed with feeder trenches directing the dirty coolant toward the centrally located coolant cleaning equipment. Pumping equipment is usually in duplicate for the reason that stand-by equipment is essential in case of accessory failures. The central coolant system may have cooling equipment attached and there are cases where a secondary coolant cleaning device may be attached to the machine tool where the cleanliness requirements of the coolant may be beyond the results produced by the central system.

Coolant cleaning equipment of many types can be installed in this manner. Magnetic Separators have been widely accepted. Flotation units are usually centrally installed. Diatomaceous Earth Filters are found many times used in conjunction with settling. Area Type Filters of the automatically replaceable media design have been successfully used in central coolant systems.

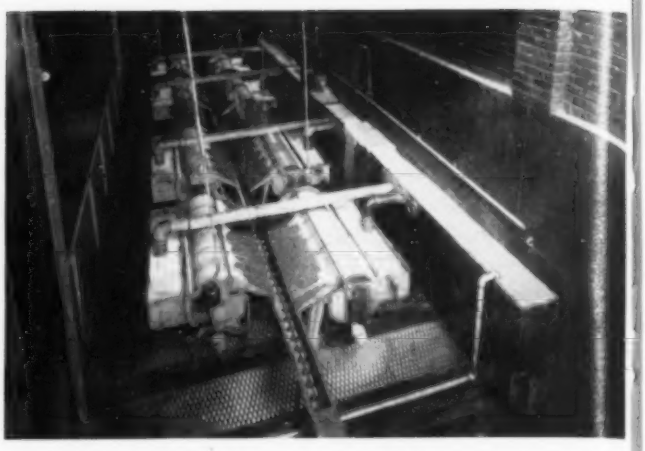
There seems to be no definite trend toward or away from these systems because the choice of either the individual installation or the central coolant system is dependent upon the machining operation in question, the nature of the physical plant, the permanence of the production plan and schedule and the choice of the personnel involved with equipment selection.

On high production machines in groups or on low production machines in great quantities where large volumes of coolant are used, the central coolant system may be more desirable because coolant cleaning equipment required to handle a large coolant flow from one machine tool will usually require more space per unit volume of coolant than the central system handling the coolant flow of many times that of an individual machine. As an example, we would

cite a case where you have a very large vertical spindle surface grinder requiring a coolant flow of some 500 GPM. Alongside this grinding machine, you may have several other grinding machines where the coolant flow may not exceed 25 to 30 GPM. If you were to choose individual installations on each of these machines, you will probably require an initial investment much greater than if you were to use the 500 GPM requirement as the basis for your selection. A 500 GPM coolant flow should require coolant cleaning equipment that would occupy a space of about 80 square feet. The cost of this equipment should fall within the realm of from $12,000.00 to $15,000.00. On this basis, the initial coolant cleaning cost of the application was about $3.00 per gallon per minute. Compare this with the cost of an individual installation where a grinder having a coolant flow rate of 20 GPM requires coolant cleaning equipment that costs between $900.00 and $1100.00. On this particular application, the initial cost of cleaning the coolant was $45.00 per gallon per minute. Many examples of this type of cost analysis could be given but, in general, central coolant systems are lower in price than are other types of coolant systems when capacity and efficiency are considered.

The bypass method of installing coolant cleaning equipment is usually used where contaminant loads are very light and relatively small quantities of oil must be handled in a short period of time (see sketch II). Bypass systems have found a major application on hydraulic systems associated with machine tools or on final "polishing" operations of a liquid. Mineral oils and other oils of higher viscosity are satisfactorily handled with the bypass installation if the contaminant load has been relieved by some piece of preliminary cleaning equipment. Here is a type of an installation where the permissible level of coolant contamination must definitely be known before you can select the type of equipment that you would use. The turnover time of the oil is a very important factor in the selection of this type of equipment. As a case in point, we will assume that a reservoir contains 150 gallons of a mineral seal oil coolant. In selecting the size of the filtration equipment to be used on this application where the filtration equipment would be installed on a bypass system, the manufacturer of the filter will, after checking the coolant for contaminant content, recommend a turnover ratio. This is a representation of the number of times that the entire mass of oil will be filtered in one hour. A very frequent turnover ratio is 1:15. This means that the coolant will be recirculated fifteen times in one hour. Of course this turnover ratio will vary with the amount of contaminant in the oil, the viscosity of the oil, the degree of cleanliness required, the mass of oil involved, and the length of time that the oil can normally be used before rejection.

In the cleaning of cutting oils and coolants these bypass systems are used only where a final cleaning of the oil is necessary following the precleaning by some primary piece of coolant cleaning equipment.



Central system is shown here. This system provides coolant cleaning through Barnesdril Magnetic Separators for all production grinding machines within the plant.

Another variation of the bypass installation is the combination of full flow and bypass (See sketch III). As an example of this type of an installation, we would cite a magnetic separator installed on a centerless grinder. Usually, these grinding machines have a coolant flow in the area of 15 to 20 GPM and magnetic separators can usually be applied. However, at the end of the grind of each piece, the machine operator will usually close the machine coolant supply valve or this may be an automatic function of the machine. In any event, the coolant flow to the wheel head is stopped. If we were to install a light pressure relief valve in the coolant line so that when the coolant supply at the nozzle was discontinued, we would automatically bypass through this relief valve into the magnetic coolant separator, this separator would function 100% of the time rather than the 65 to 75% of the time that they are normally functioning where the cleaning operation is stopped when the coolant flow is stopped. Many people think the magnetic coolant separators are inadequate, but it is not the inadequacy of the piece of equipment, but the improper installation and combination full flow and bypass installation would certainly remove part of their trouble.

One other system of cleaning coolant is the batch system which, as the name implies, utilizes the fact that an entire mass of oil is cleaned at one time without interruption or without any connection to the machine tool utilizing the particular coolant. This type of an installation is used under several circumstances. It may be that the low discharge height or the lack of any coolant discharge through a central location would not permit the installation of coolant cleaning equipment on the machine tool. In this case it is practical to pump the base of the machine dry and transport the contaminated oil by means of a portable reservoir to some other location for processing.

It may be that there is no space available for the installation of coolant cleaning equipment because of the near proximity of other machines, or the requirement of coolant cleaning equipment of very large size.

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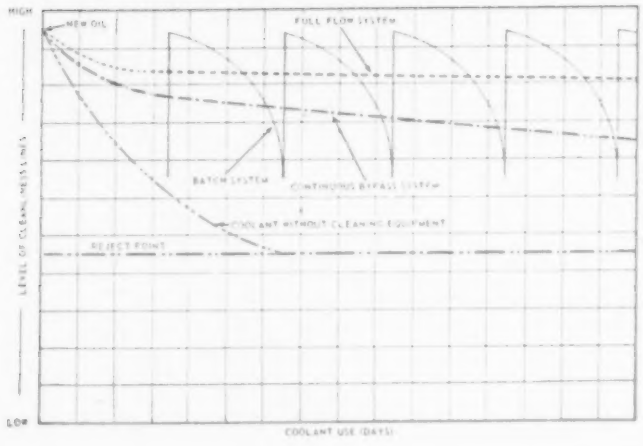
LEVELS OF CLEANLINESS MAINTAINED BY VARIOUS METHODS OF COOLANT CLEANING



In cases where high viscosity oils are involved a piece of coolant cleaning equipment may again be so large that the space is not available, or it may be that the coolant is of such a nature that it is very expensive and that it is foolish to discard after contamination.

There are cases where very small particles of contaminant are causing trouble on the machine operation and yet no full flow method of cleaning is satisfactory for the cleaning of the oil, and a bypass system would not give the results required.

Another place where the batch system has found a good firm application is in the cases where oil comes from chip ringers or where oils must be sterilized. In the case of the sterilized oils the high heat that accompanies sterilization will usually cause such a lowering of the viscosity that a smaller piece of coolant cleaning equipment may be utilized whereas, if the viscosity of the oil were measured at the ambient temperature, the viscosity would be so high that it would require a very large piece of coolant cleaning equipment, thus a very costly installation.

The batch type installations are usually found in the larger shops or in areas where organizations have been set up to process the coolants from various plants. There are some organizations that have made a business of contacting the users of these heavy oils, particularly screw machine shops, the idea in mind that the servicing organization would take their entire batch of oil from the existing reservoirs, load it in portable reservoirs, refill the machine reservoirs with clean oil and take the contaminated oil to some location, filter it, sterilize it, and put it in new containers and resell it to the users at a lower price than they could get it for from compounders as new oil.

The choice of a batch system proved to be entirely satisfactory on a honing application where a 45 SSU oil was used. The material being honed was aluminum. Usually in the honing process, where aluminum is involved, the particle size of the contaminant is very small. The usual area type fabric filter would not satisfactorily clean the coolant. Laboratory tests indicated that some of the aluminum was removed, but not enough to warrant the purchase of the considered piece of equipment. Coolant cleaning equipment of the area filter type was available, but the installation costs would have been exceedingly high and a batch type installation would be cheaper.

This problem was adequately solved by the batch method by allowing the aluminum to settle over a period of time, decanting the semi-clear liquid above the settled solids and finally filtering the semi-clear liquid through a diatomaceous earth filter. Compared to the cost of the machine tool, the installation cost was very low, the quality of cleaning produced was very high, and the cost of operating the piece of equipment very low. The cost of cleaning this oil would have been much higher if the application would have been full flow and certainly, it could not have been handled with a bypass system.

The graph shown is a representation of the efficiency curves presented by the three major types of equipment installations: full flow, the bypass, and the batch type installation. You will note that in each of these three cases, the filtration engineer has an opportunity to select the level of cleaning produced by the equipment. One of these three types of applications can be used on every machine tool using coolant.

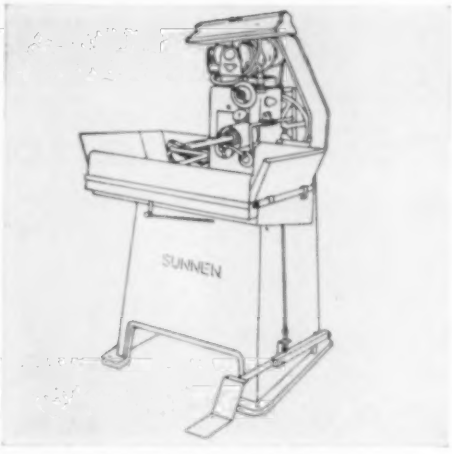
It is not uncommon to see installations where engineers have paid as much as 10% to 15% of the original cost of the machine tool for coolant cleaning equipment and have this equipment installed in such a manner that it is only operating at 30% to 40% efficiency. It may be that these engineers are not aware of the proper way of installing the equipment and we would suggest that when you are contemplating the purchase of coolant cleaning equipment and are accepting quotations for this equipment, that you get the supplier to give you a layout sketch or drawing showing the recommended method of installation or some alternate methods of installation that you may use if their first recommendation cannot be accepted. Competent coolant cleaning manufacturers and filtration engineers will usually do this for you at no cost to you and it certainly establishes a much firmer basis on which to do business. Coolant cleaning equipment manufacturers usually like to sell their equipment on this basis because it gives them some guarantee that their equipment will be properly installed and will function to the customer's advantage.

These suppliers realize that every piece of equipment that is functioning properly is a credit to the engineers who recommended, purchased, and made the installation and that the installation is an aid in advertising and selling on the part of the supplier as well. Competent suppliers do not like to see their equipment fail in operation and it is through the equipment engineer's request of the supplier's assistance in suggesting the installation that both the buyer and the manufacturer of coolant cleaning equipment will remain friendly. • • •

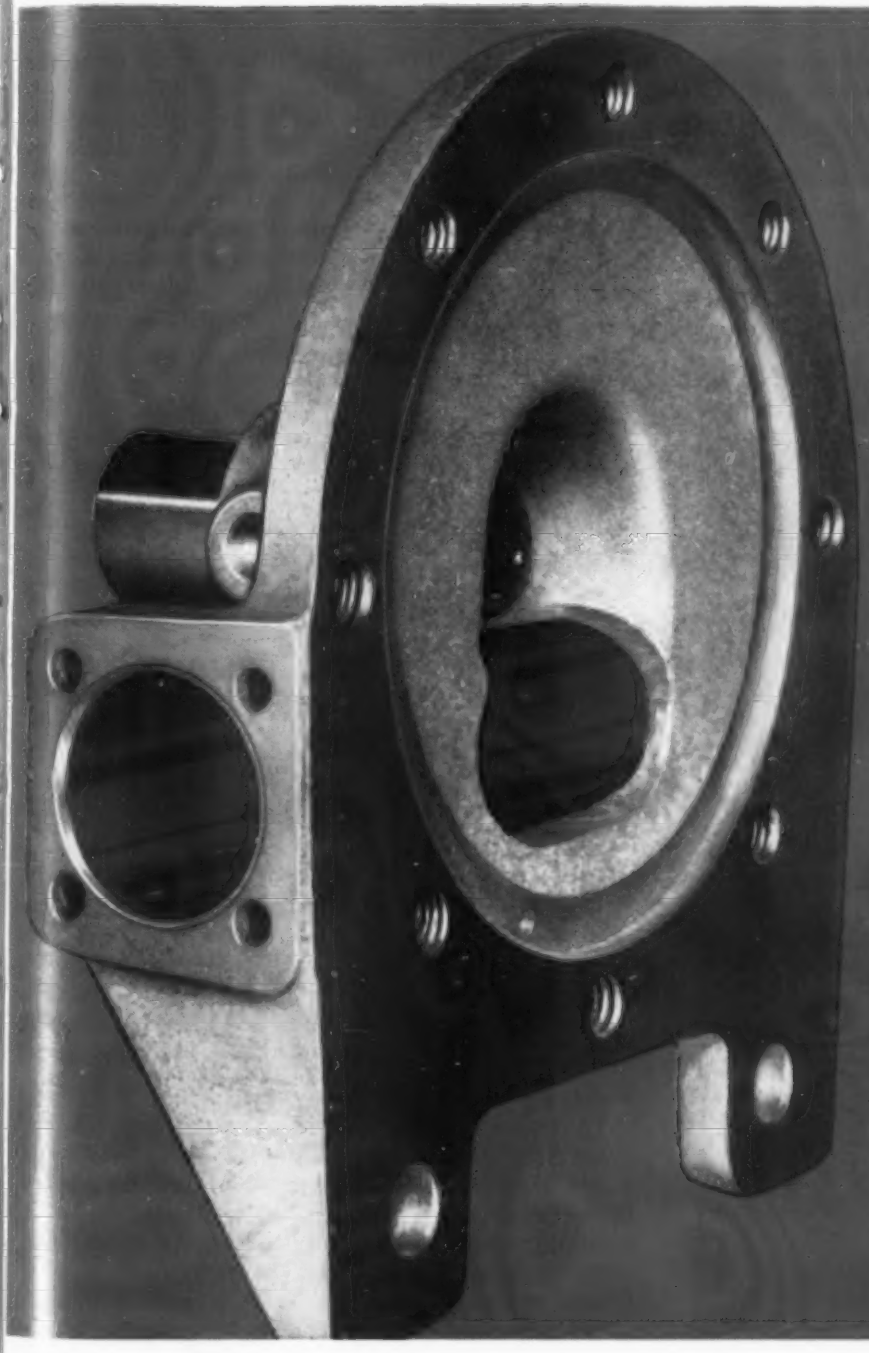
We wish to acknowledge the photo on page 25, April issue, as pertaining to U. S. Hoffman Machinery Corp.

PROBLEM:

PRECISION AND FINISH IN A BUSHED AND PORTED BORE



SOLUTION: First, the bore in the casting is Sunnen Honed to assure a leak-proof press-fit for the bushing. After assembly, a large port is machined in the bushing.



Finally, the bushing I.D. is Sunnen Honed to geometric roundness and straightness . . . with a tolerance of .0004" and a finish of 8 micro-inches.

Grinding required expensive fixtures for both operations and could not hold the specified tolerances. Many assemblies failed on pressure test.

Sunnen Honing eliminated fixtures and fixture set-up time. The long, self-locating honing tool bridged the port . . . eliminated washout . . . and guaranteed the specified tolerance and finish.

Result: No defective assemblies—no production delays.

You can handle precision work like this for an investment of less than $1,000. Ask for a free demonstration.

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Raw Materials Testing

the first step in the manufacture of today's grinding wheel

Part 1

By *James R. Gilman*
Manager of Quality Control
Bay State Abrasive Products Co.
Westfield, Mass.

• The story of how an abrasives manufacturer can turn out thousands of wheels of a certain specification, and be assured that the performance of each wheel will be completely predictable within a minute range of error is an interesting one. It shows the extent to which quality control is used in the abrasives industry today.

An abrasive products manufacturer must standardize on formula and processing. The ingredients he uses must be carefully specified. The manufacturing steps must eliminate human error as much as possible. Yet all his efforts in the manufacturing process will be worth nothing if the raw materials he obtains from many suppliers do not fall within acceptable limits of variation. For that reason the most progressive abrasives manufacturers have worked out over the years a rather extensive series of raw material tests.

1. Friability test determines grain toughness.

Here are a few examples of the type of testing now being carried on for abrasives, bonding ingredients, fillers and other modifying agents, with an explanation of how these tests help guarantee the uniformity so necessary in abrasive products.

Testing Abrasive Grain For Toughness

Currently, the two most commonly used man-made abrasives are aluminum oxide and silicon carbide. Each has certain unique qualities of great value in grinding.

Aluminum oxide is an extremely tough abrasive. This quality is useful in grinding steel and other high tensile materials, and in snagging applications where heavy stock removal under high pressures takes place. Toughness is measured by a friability test which determines the impact resistance of the grains.

In silicon carbide the important property is this abrasive's sharp crystalline structure. Silicon carbide breaks down more easily than aluminum oxide, and exposes new sharp cutting edges in the process. This makes the abrasive highly desirable for grinding low tensile materials such as cast iron, aluminum, copper and brass and extremely hard and brittle materials such as marble, concrete, glass and cemented carbide.

Examination under a microscope tells whether or not the desired crystalline structure is present, and friability tests such as used on aluminum oxide show whether the abrasive is tough enough.

A weighed amount of abrasive grain of known size is impinged at high speed on a steel plate. The grain is then rescreened and the size accurately determined. The amount of breakdown of the grain due to impingement on the plate is a measure of the grain's friability or tendency to fracture under shock.

Testing Abrasive Size

To insure proper structure and density, abrasive grain size must be uniform within certain limits. U.S. Government standards establish acceptable ranges of variation from the norm for all grain sizes. For example, number 36 grit must retain:

No particles on a 20-mesh sieve

No more than 25% on a 30-mesh sieve
At least 45% on a 35-mesh sieve
At least 70% on combined 35 and 40-mesh sieve
No more than 3% can pass through a 45-mesh sieve

The testing of grain size is fairly simple. As evident in the table above, the investigator simply sets up a series of screens or sieves of progressively smaller mesh. He then dumps a weighed composite sample of the supplier's shipment onto the screen arrangement with the largest mesh sieve on top. The nested series of screens or sieves are then shaken and tapped for five minutes. The amount of grain retained on each sieve is weighed and its percentage of the total sample determined.

In this test, called the Ro-Tap Test, acceptable samples must conform to the standards set up by the government. When samples have an excess of the allowable percentage of any fraction of the composite grains, the lot is unacceptable.

Abrasive flour consists of grains that are too small to be checked by means of the Ro-Tap Test. Instead, a specific gravity test is used. Here a small sample of the flour is dropped into a glass tube containing an alcoholic solution. An accurate determination of distribution of grain size is supplied by measuring the amount of flour that settles to the bottom of the tube within a given amount of time. This is known as the Sedimentation Test.

In addition, abrasive flour grains are checked for grain size with a microscope.

In all these tests, the kegs of grain in a shipment are blended to even out variations among them. All tests are performed on samples of the individual kegs before blending and on the master batch after blending. Any significant difference may indicate one or more individual kegs of non-standard grain and is sufficient basis for more intensive examination of the grain shipment before release for production or return to supplier.

Testing Abrasive Shape

Other important tests run on both aluminum oxide and silicon carbide measure the shape of grain particles. Shape differs widely in various abrasive products. For grinding wheels a block-shaped grain is required. For coated abrasive products, a flat silver-like grain is best.

The Bulk Density Test is one method of determining grain shape. Here grain is allowed to flow freely through funnels suspended above a standard volume graduate. The weight of the grain in a full graduate indicates shape, since certain shapes take more room than others. Thus the graduate weighs less or more depending on particle shape.

Determining the shape of the grains of abrasive flour requires special tests, such as the Ball Point Test which indicates shape by determining the amount of a special oil needed to wet up a standard quantity of grain and cause it to coalesce to a ball form.

The Packed Density Test may also be used with abrasive flour. In this test the technician determines shape by tapping on a rubber pad a graduate containing the flour . . . until it has settled to a minimum volume.

2. The Ro-Tap test as used to determine grain-size composition.

Other Abrasive Tests

Numerous other tests are run on raw materials to guarantee the uniformity and exact duplication necessary for dependable abrasive products. Even color purity undergoes testing. For example, white aluminum oxide is tested for color purity by molding a sample of grain into a test wheel with a clear transparent bond. This wheel is then fired in a kiln. After firing the wheel is examined for discoloration. Only a few imperfections or specks are allowed. Other abrasives also are tested for color, including even green-black varieties of silicon carbide.

To make the most of its properties, each of which is tested in some manner, it is necessary that the abrasive contain no impurities. All abrasives are tested for cleanliness and purity by means of the Capillarity Test. In this test a vertical glass tube is filled with abrasive grain. Measurement of the rate of rise of water up the tube by capillary action indicates degree of purity. Water will rise rapidly in clean grain, slowly in an unacceptable sample.

Testing Vitrified Bond

More than half the grinding wheels made today are manufactured with vitrified bond. This is a ceramic, multi-component material composed of various clays, frits (pre-fired and crushed ingredients), feldspar and other materials. A glass type is used with aluminum oxide abrasive and a porcelain type with silicon carbide.

Vitrified bonds are best known for their inherent porosity and rigidity. These qualities provide fast, economical stock-removal. Grinding wheels made with this bond are especially well suited to precision work.

Tests are made on the various components of vitrified bonds and then on the mixed bond material. For example, these include a sieve test to determine

3. The sedimentation test determines distribution of grain-size in abrasive flour.

4. In the bulk density test, shape is determined by the weight of a standard graduate filled with free-flowing grain.

Quality Control in Grinding Wheels Manufacturing

particle size . . . an appearance test . . . along with spot checks of chemical analysis to determine purity. The vitrified bond mixture is tested for degree and nature of flow by means of pressed tablets which are heated in test kilns at temperatures corresponding to those encountered in the manufacturing process. The color, character, and degree of flow are measures of the suitability of a batch of bond for use in wheel production.

Testing Resin Bonds

Other commonly used bonds are resinoid, rubber, shellac, and metal. Resinoid bonds are noted for their toughness, heat resistance, and resilience. An extremely important test for indicating the reliability of resins in imparting these properties to the bond is the resin flow test for powdered resins and a viscosity test for liquid resins. In the resin flow test a pressed tablet of resin is heated to a temperature just above its melting point and allowed to run down an inclined slab. Measurements of flow within a given period of time indicate the suitability of the resin for use in resinoid bonds.

Degree of viscosity of liquid resins is tested by the Pipette Test. In this test, a sample of resin is placed in a glass pipette and held at a constant temperature. The resin is then allowed to flow and its rate of flow measured. Viscosity value is determined by amount of flow.

5. Vitrified bond flow test.

6. In the resin flow test a pressed tablet of resin is heated to a temperature just above its melting point and allowed to run down an inclined slab.

7. Lime, used to absorb moisture in the curing process, is tested for rate of heat evolution when slaked with water.

CDP is a registered trade mark of Koebel Diamond Tool Co.

"What a difference CDP* makes"

Over and over we hear this from people after they try (and then standardize on) KOEBEL CDP* dressing tools for grinders.

CDP* tools are different—IN ECONOMY

- you use up every point and piece of every diamond particle.
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- you eliminate diamond resetting.
- you get more pieces per dressing.
- longer wheel life cuts wheel costs.
- you cut diamond tool costs (see example).

CDP* tools are different—IN PERFORMANCE

- there's a big difference in results (see typical example).
- they even do jobs big single diamonds can't do efficiently.
- they take the guesswork out of diamond performance by insuring *uniform* results, tool after tool.

Yes, CDP* tools are different

- there is no quality variation in CDP* dressing tools.
- it is their design and manufacturing uniformity that gives you such uniform results.

CDP*- Cemented diamond particles—small diamond particles set into a matrix which automatically adjusts itself to diamond wear.

A typical wheel dressing example

	Single Diamond	CDP* Dresser
Life	5 days	60 days
pcs/dressing	12	25
cost/100 pcs.	1.7 cents	0.5 cents

(¼ the tool cost per piece, half the wheel cost, less downtime and double the wheel life.)

CDP* tools take the guesswork out of diamond tools and convert them into WORKHORSES OF INDUSTRY. What carbides did for machining, CDP* tools are now doing for grinding.

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CDP DRESSING TOOLS—SINGLE & MULTIPLE DIAMOND DRESSING TOOLS—CDP CUTTERS

Quality Control in
Grinding Wheels Manufacturing

Testing the raw materials is the first step in assuring a quality grinding wheel

When a wheel which has been doing a successful job eventually wears out its replacement must be as near an exact duplicate as it is humanly possible to make it. For this reason it is the goal of every grinding wheel manufacturer to make each wheel, within a specification, an exact duplicate of every other.

Many different resins both liquid and powdered, are used in the manufacture of abrasive products and all are tested. Various liquid and powdered modifying agents go into the finished bond mixture and these also undergo various tests. Typical modifying agents are lime, Cryolite, Cresylic acid, and various petroleum fractions. Tests are made for specific qualities in each of these various resins and modifying agents.

8. The Scott tensile machine tests fabrics for tensile strength.

Tests for volatiles (such as water) are made on liquid ingredients and on dry ingredients where moisture content is critical. Lime is an example of a dry ingredient used to absorb moisture in the mix or evolved during curing process. If the moisture is not absorbed, it will cause pressure internally in the wheel at water vapor and will cause it to swell and to be weak when cured. Such a wheel will give poor grinding performance. In addition, lime acts as a catalyst in the curing process. Lime is tested by adding water to a standard weight. As the lime slakes, the rate of temperature rise is measured. This rate must follow a predetermined standard curve. Any deviation from this curve is basis for rejection of the entire shipment.

Considering the various types of resins used, and the various modifying agents that can be combined with them, there are many possible variations in the type of resin bond that is finally cured. Tests of modifying agents and resins are highly important since they affect mixing, pressing, behavior in cure, and the final cured result.

More Tests . . . From Fabrics To Spindles

Reinforcing fabrics are one of the many secondary materials commonly used today in the manufacture of abrasive products. Fabrics are used in wheels for cut-off work. To insure that the reinforcement will do its job properly, the fabrics must be tested. Tensile strength is tested by the Scott Tensile Machine. Tests for elongation, wearing ability, thread count and weave also are conducted. Fabrics are also used for coating and tests are made to insure that such materials impart the proper properties to the coated fabric. Coatings are used primarily as protective coverings and must be examined to make sure they provide this protection.

Also a number of other items are used in the manufacture of wheels or as parts of wheels. These include spindles, conical cutters, metal inserts, setting sand for kiln cars, steel shot and a host of other ingredients and parts. All must be tested.

New methods of testing are being devised at this very moment. Work is being carried on constantly to refine and improve that important first step in the manufacture of the modern grinding wheel . . . raw materials testing. Testing that insures a predictable product than can be depended on.

End of Part 1. The next part, in June, will tell how quality control methods have cut rejects in half.

• • •

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Chicago Wheels are available in all standard sizes and over 200 special shapes. This wide selection of these tough, fast cutting Chicago Mounted Wheels makes it possible for you to choose just exactly the right mounted wheel for your job. And delivery of most Chicago Mounted Wheels is prompt . . . right out of stock.

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CHICAGO MOUNTED WHEELS are manufactured under positive density control to insure peak job performance.

GUARANTEED to stay on their mandrels, they are perfectly balanced, easily dressed, and hold their shape.

SAVE TIME, MONEY, MATERIALS . . . any number of combinations of dimension, shape, grain size and bond.

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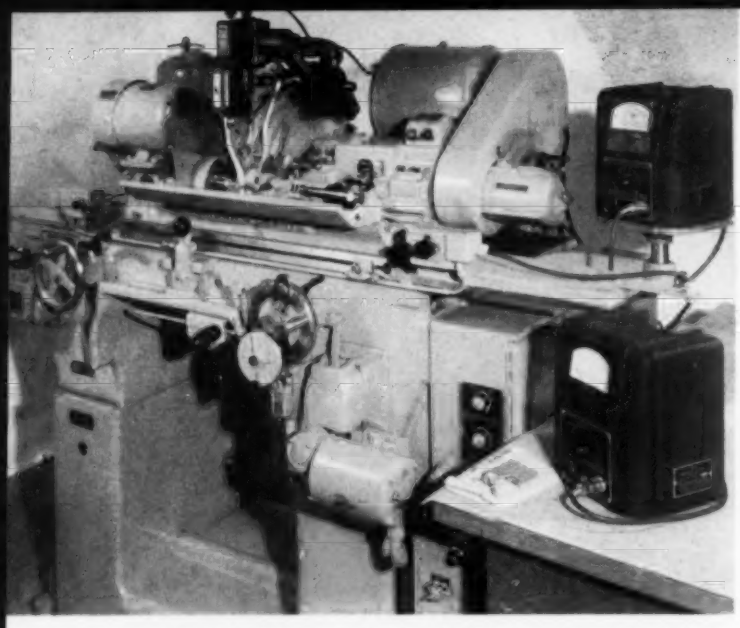
Firm Name .....

Street Address .....

City ..... Zone ..... State .....



No. 5 Plain Grinder with Ceda/Size, Electronic Caliper Gage and Amplifier for grinding super-precise small cylindrical parts. The upper amplifier is the Electralign for electronic alignment of the swivel table, assuring the parts will be grouped true and straight.

Production Grinding to Millionths

—Ceda/Size Breaks Through the Precision Barrier

By **JAMES MEEHAN,**
Director of Brown & Sharpe Grinding Machine Sales

BROWN & SHARPE MFG. CO. CELEBRATES 125th ANNIVERSARY WITH "PROGRESS IN PRECISION"

"Progress in Precision" is a very appropriate theme for the 125th anniversary of Brown & Sharpe Mfg. Co. The following is a list of their steps in precision.

1833—Established "to make and repair clocks and watches and do other light mechanical work of precision."

1850—Built an automatic linear dividing engine. After over 100 years of continuous service it has not been superseded for its particular class of work.

1855—Built first precision gear cutting and dividing engine. Also built first American made gages for producing sizes of wire.

1860—Turret screw machine was first machine tool built by Brown & Sharpe

1861—Invented and built first universal milling machine for making twist drills. Also first formed cutter which can be sharpened on its face, without changing its form.

1865—Invented first universal grinding machine.

1890—Established patent for first automatic screw machine.

1901—Introduced unit construction for milling machine.

1935—Introduced omniversal milling machine.

1937—Introduced permanent magnetic chucks.

1952—Introduced four new advanced design universal grinding machines.

1955-58—Introduced Intrimik, a new internal micrometer.

1955—Introduced new design automatic screw machine, new face grinder, and Rangemaster sliding head type milling machine.

1956—Opened "Precision Center" a large display and training area.

1956-57—Introduced over 600 new industrial products for metalworking industry.

1957—Introduced new design automatic screw machine with three different spindle sizes.

1958—Introduced "Ceda/Size" a new grinding development which enables an operator, possessing very little skill, to grind to millionths, new 5" x 10" surface grinder and a new convertible thimble micrometer.

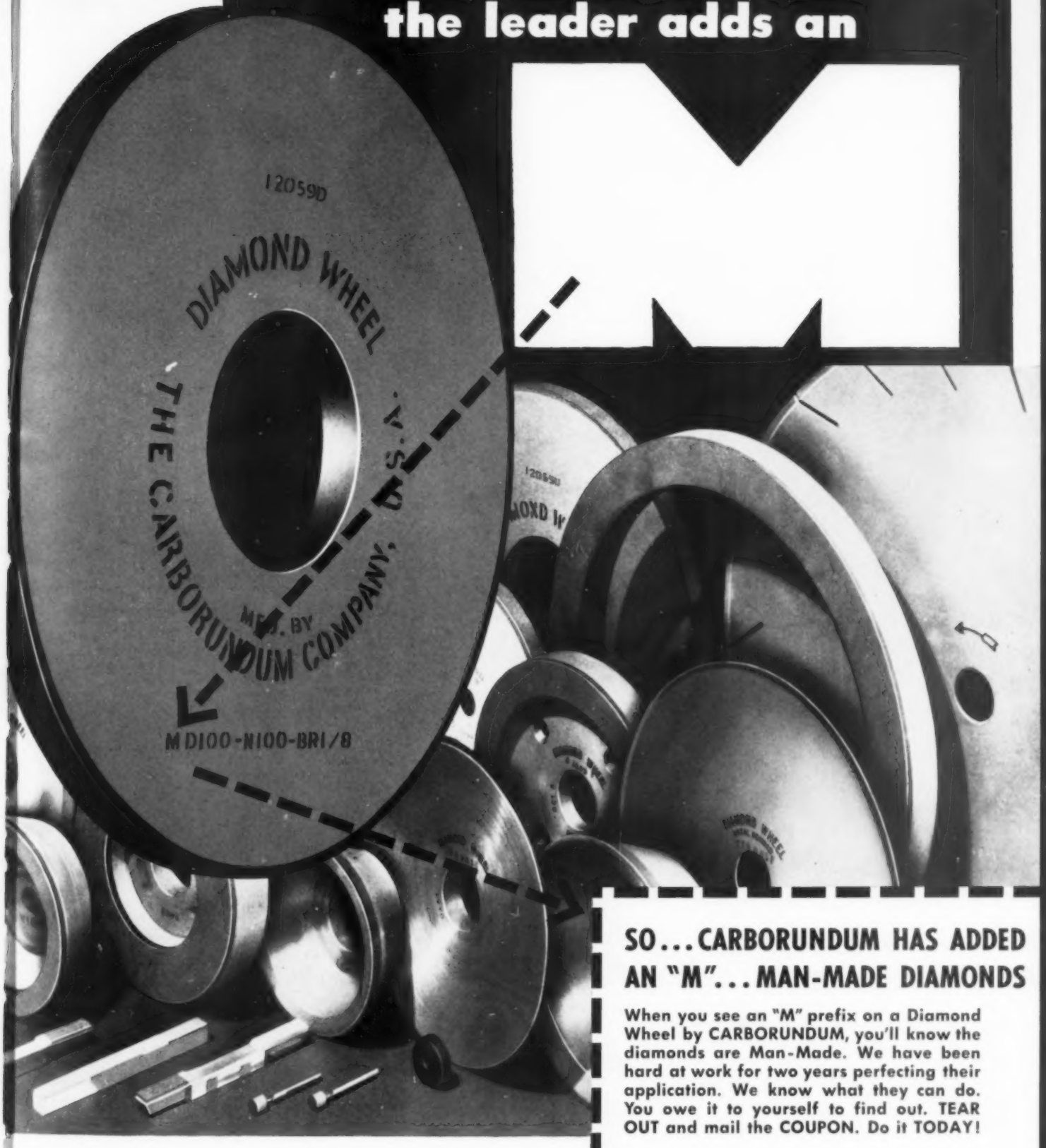
At the recent open house in the Brown & Sharpe "Precision Center," the latest steps in their "Progress in Precision" were on display. Items which caught our interest were the numerous new precise gages and measuring instruments, a new precision ground tool steel which is pre-blued, and of particular interest a new No. 510 surface grinder and No. 5 plain grinder with the "Ceda/Size" control which is discussed in the accompanying article.

• CULMINATION of long research by Brown & Sharpe engineers on production grinding of small cylindrical parts to extremely close limits is particularly timely. Missile design requires super-accuracy in its components, and this new concept—Ceda/Size—will greatly speed and simplify both cylindrical parts production and the mating of them to equally accurate holes.

Fuel injectors for diesel engines operate under high pressure and require a very accurately-fitted piston and cylinder. Until recently, fuel injector pistons had to be individually fitted by lapping to their mating cylinders. About 1948 a prominent manufacturer of fuel injectors estimated that if the pistons could be ground to within plus or minus twenty millionths ($\pm$ 0.000020") of a given size, straight within ten millionths (0.000010"), round within ten millionths (0.000010") and with the surface finish under 2 Micro Ins. R.M.S., it would be unnecessary to do any lapping, and a better operating piston would result. The Brown & Sharpe No. 5 Plain Grinding Machine, with refinements, equipped with the then **newly**-developed Electralign for the electronic alignment of the swivel table, was very successful in meeting all these requirements for this manufacturer and a large number of these No. 5 Plain Grinding Machines are now engaged in the production grinding of small parts to plus or minus twenty millionths ($\pm$ 0.000020").

Now with basic requirements on finish grinding size increased to limits of plus or minus ten millionths, a new approach was required—and Ceda/Size is the answer.

the leader adds an



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When you see an "M" prefix on a Diamond Wheel by CARBORUNDUM, you'll know the diamonds are Man-Made. We have been hard at work for two years perfecting their application. We know what they can do. You owe it to yourself to find out. TEAR OUT and mail the COUPON. Do it TODAY!

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THE CARBORUNDUM COMPANY is proud to announce the addition of MAN-MADE industrial diamonds to its already outstanding line of Diamond Wheels. For many years CARBORUNDUM has been recognized as the leader in the development and manufacture of Diamond Wheels and Hones. Constant close liaison with world-wide diamond markets and vigilant exhaustive research and development have kept the CARBORUNDUM line out in front. Due to very recent developments by American industry and science, no line of industrial products is now complete without MAN-MADE diamonds.

Ask the man from

CARBORUNDUM

REGISTERED TRADE MARK

"Ceda/Size" is a means of producing and controlling an extremely fine grinding feed, with an Electronic Comparator Caliper of 3/16" to 1" work capacity riding on the work, and an Amplifier registering changes in work diameter in increments of a few millionths of an inch. Wide spaced graduations on the Amplifier scale make small changes in work diameter easy to observe.

The operation of "Ceda/Size" is extremely simple—

1. Utilizing the Electralign, a test piece is ground straight.

2. A master having the exact mean diameter to which the parts are to be ground, or a precise sample of the part to be duplicated, is placed between centers.

3. The Electronic Caliper Gage is placed on the work, and with the headstock revolving and coolant running as in actual grinding, the knurled knob at the top of the caliper is adjusted to bring the indicator on the Amplifier to zero. The machine is now ready to grind with ease, any number of parts on a production basis, duplicating the size of a master within plus or minus ten millionths.

4. In operation, a work-piece is placed in the machine and the Electronic Caliper Gage placed in position on the work. The wheel is advanced to grinding position and the work ground by hand until the Amplifier indicates the size is within about fifty millionths (0.000050") of zero. At this point, the Ceda/Size lever is depressed. This produces and controls an extremely fine grinding feed of millionths of an inch per work revolution. When the indicator on the Amplifier reaches zero, the work has reached finished size within an accuracy of ten millionths (0.000010") and is round and straight. These results are easily obtained with operators of average experience.

This accuracy is obtained with a No. 5 Plain Grinding Machine having all alignments reduced to an objective of "0" and having special carbide-tipped centers. The machine is fitted with Electralign to insure easy, accurate control of taper. The machine is set on isolation mountings, of the tempered spring type, to protect it from external vibrations. Means are also provided to filter the coolant and maintain it at room temperature. This machine is also equipped with a Wheel Slide Rapid Travel Arrangement and an Automatic Cycle and Spark Timing Arrangement and Continuous In-feed for plunge cut grinding. However, if the parts are round and straight with carefully lapped center holes and come to the machine within two to three tenths (0.0002" to 0.0003") of finished size, the Automatic Cycle and Spark Timing Arrangement and Continuous In-feed are unnecessary.

Often, cylindrical parts finished to such accurate dimensions are required to mate with a bore to precise limits of clearance. Using the Electromate Attachment on the machine in conjunction with Ceda/Size, accurate control of clearance can be maintained to plus or minus 20 millionths, with bores varying as much as 0.0002" in diameter. Wider bore diameter variations are allowable if clearance limits are increased proportionally.

The Electromate Attachment consists of a computor-selector unit and a bore gage for holes from 3/16" to 1" diameter. The bore with which the cylindrical piece is to mate, is placed on the gage and used as reference for grinding the piston.

The computor-selector controls provide choice of three functions to provide extreme flexibility and usefulness for all types of precision grinding applications. The switches permit the Amplifier dial to indicate with a choice of increment values from 0.0001" to 0.00001" any of the following:

1. The actual diametral size difference of the bore and external gages.

2. The bore gage size only.

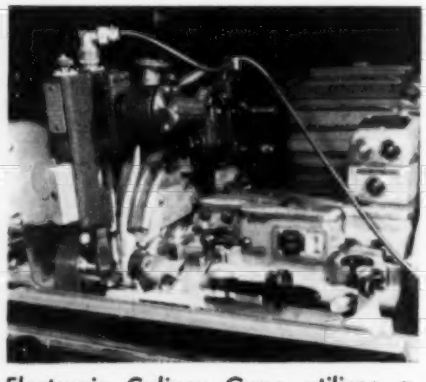
3. The external gage size only.

Ceda/Size and the Electromate Attachment thus permit a semi-skilled operator to:—

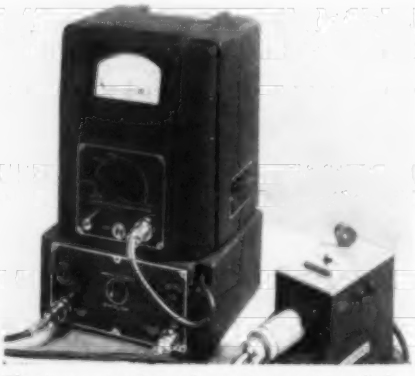
1. Plunge grind suitable parts to predetermined size *within* plus or minus ten millionths (±0.000010").

2. Plunge grind a group of parts to predetermined fit in a group of mating holes *within* plus or minus twenty millionths (±0.000020"), without making individual measurements and calculations, and even though the holes may vary in size by two ten thousandths (0.0002").

3. Perform fitting or finishing operations on a group of similar parts, removing as little as ten millionths (0.000010") stock or up to two ten thousandths (0.0002") from each piece *within* an accuracy of plus or minus ten millionths (±0.000010"). • • •



Electronic Caliper Gage utilizes a work-riding caliper and amplifier to continuously check the size of the part being ground. Wide-spaced graduations indicate increments of a few millionths of an inch.



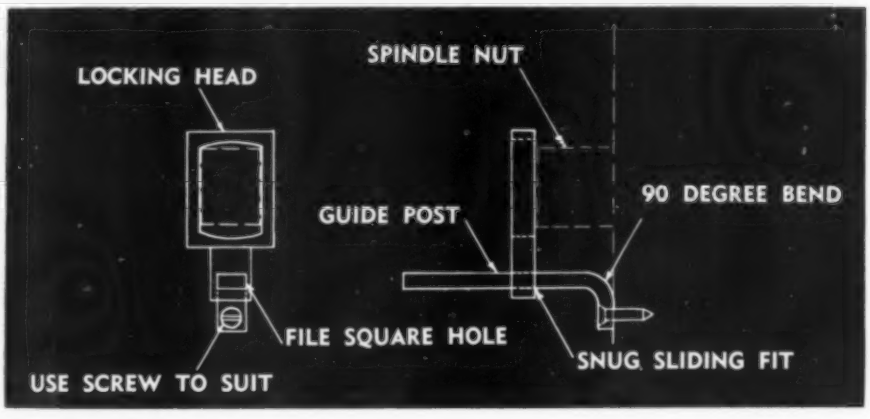
Electromate Attachment consists of the Computor-Selector unit (under the amplifier) and a Bore Gage. Cylindrical parts can be ground to mate with the bore of a piece placed on the gage to any desired fit or clearance up to limits of 20 millionths.

Depressing the Ceda/Size lever produces and controls an extremely fine grinding feed of millionths of an inch per revolution. When the indicator on the Amplifier reaches zero, the work has reached finished size.

---wherever abrasive operations are performed

SHOP HINTS AND KINKS

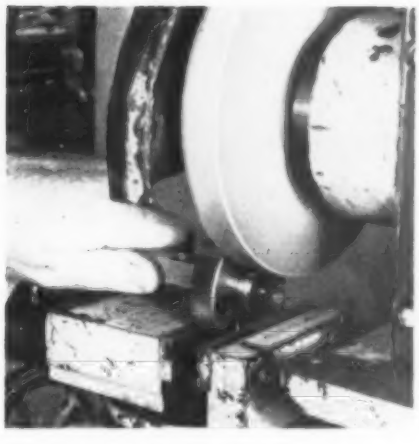
Spindle Lock for Surface Grinder



By **Robert Hill**

• The above illustration shows a spindle lock that may be used on surface grinders. The old method of removing or changing an abrasive wheel hindered progress and required two men to remove a wheel. With this spindle lock, as shown, the operator can remove the wheel himself. A piece of flat stock is shaped to fit over the spindle nut and has a hole drilled at the lower end, the hole is filed square to receive the Guide Post. A snug-moving-fit is required for the nut holder and guide post so the holder can be moved on or off the spindle nut. A full 90 degree bend is made at the base of the guide post, then a hole is drilled to receive a screw that holds the lock in position on the grinder, if desired the guide post can be brazed or tack welded to the grinder. When a wheel is to be changed the operator adjusts the spindle lock by sliding the holder down over the nut, then proceeds to remove the wheel and after the change is made he removes the holder from the nut. With the old method, one man had to stand behind the machine and hold a wrench on the spindle nut while the operator removed the wheel in front. • • •

Simple Method for Removing Worn Threads from Plug Gage



By **H. J. Gerber**

• A method sometimes used for extending the life of a "go" thread plug gage is to remove the first few worn threads from the starting end of the gage.

This job may be performed between centers in a cylindrical grinder but we have used another simple method when a cylindrical

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when milling costs run high . . .

After

During

Before

SWITCH TO WALKER
PERMANENT
MAGNETIC CHUCKS

No. 618

High milling costs are often caused by complicated, time-consuming set-up operations. O. S. Walker permanent magnetic chucks* are currently being used successfully for high speed gang milling operations. The "before, during and after" illustrations show how one manufacturer is saving time and money. Even at modern feeds and speeds, Walker permanent magnetic chucks hold the work securely. When the operation is completed, only a thin section of metal remains on the bottom of the work piece, making mechanical holding a difficult and complex process. Note the absence of chips on the cutter, due to automatic demagnetization.

Walker permanent magnetic chucks save you money three ways:

- Low initial cost because of the absence of expensive electrical equipment and mechanical fixtures.
- Low operating and maintenance costs.
- Low production costs because of reduced set-up time.

With Walker chucks you are sure of work flatness and parallelism because of designed-in dimensional stability assured by solid silver brazed construction. (For milling applications, a bottom plate with key slots is recommended). **Patent Applied for*

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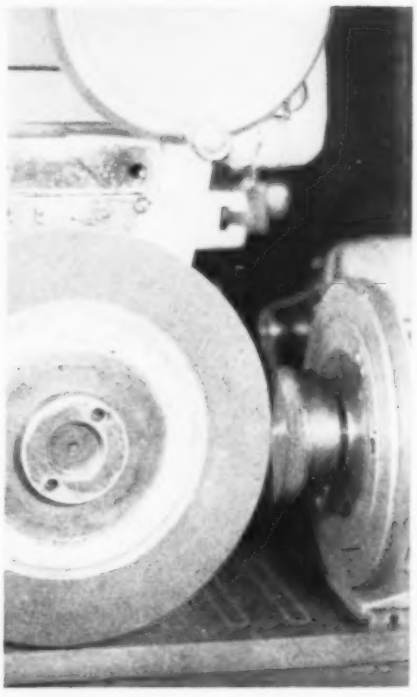
grinder was not available or in cases where the gage had no center holes.

As shown in the illustration, a thread ring gage, of the same size as the plug gage, is clamped in the vise of a tool and cutter grinder. The plug gage is threaded into the ring gage and the start of the thread is positioned under the grinding wheel. When the plug gage is turned by hand it is moved axially outward to permit the grinding wheel to remove as much thread as is desired. • • •

Improvised Face Grinding Set-up on the Surface Grinder



• Where cylindrical face grinding of small work must be performed and no proper machine is available, the illustrated improvisation will sometimes permit the job to be done on a horizontal spindle surface grinder.

The motor driven work head from a tool and cutter grinder is secured to the magnetic chuck. Work is held in collets and positioned against the wheel by hand table traverse. Feed of the wheel across the work is made by power traverse of the wheel slide. • • •

A Method to Distinguish Between Aluminum Oxide and Diamond Powder

By **R. A. Edge**

University of Cape Town

• Due to the closeness in appearance and specific gravity of diamond powder and aluminum oxide, people engaged in reclamation of diamond powder are often mislead. Aluminum oxide is widely used as an abrasive, therefore, in areas where both diamond powder and aluminum oxide are employed there must be a method which will distinguish between the two.

A chemical test taking advantage of the characteristic reaction of alizarin —S and aluminum ions enable a rapid differentiation to be made between aluminum oxide and diamond powder. Two milligrams of 10% sodium hydroxide solution are added to a few milligrams of the powder being tested. After five minutes the excess sodium hydroxide solution is decanted off and a drop of 0.1% aqueous alizarin —S solution is added to the powder. A violet color is produced. Thirty percent acetic acid solution is now added dropwise until the violet color disappears. If the powder is aluminum oxide, a red precipitate will form. Diamond powder will not react with the reagrents used. • • •

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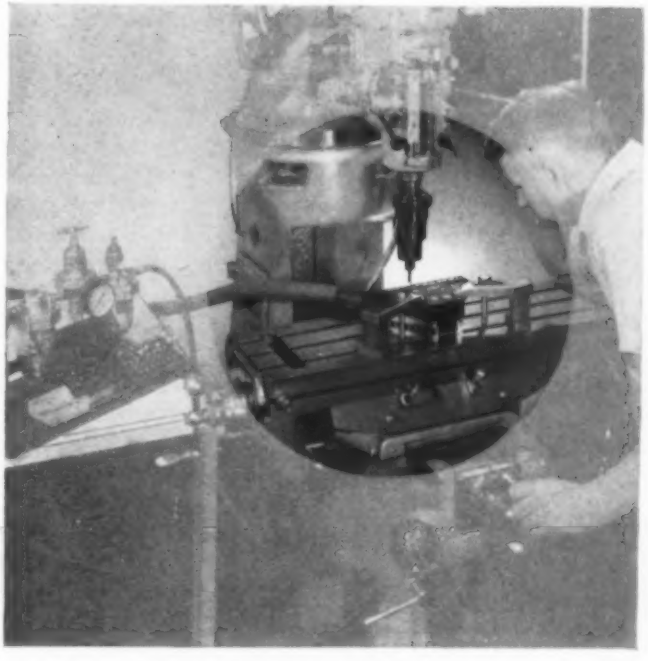
HOLES
JIG GROUND with
Vulcanaire



VULCANAIRE AND BRIDGEPORT MILLING MACHINE

Any Vertical Milling Machine can be used for jig grinding. These machines with micrometer standards can be used for jig grinding to close tolerances. Low cost jig grinding is possible with the Vulcanaire.*

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VULCAN tools

---wherever abrasive operations are performed

QUESTIONS AND ANSWERS

By **Arthur Rakestraw**

• Should coolant be used when grinding rubber and if so, what type?

I assume your problem concerns, cylindrical grinding of rubber rolls. If so, these rolls may be ground either with or without coolant. In both cases it is necessary to insure that as little heat as possible is generated during grinding.

Water flooded on the work at the point of contact, will reduce grinding temperature, however, I suggest the use of a rust preventative in the coolant to guard against rust accumulation in the base of the machine.

When dry grinding rubber rolls, an exhaust hood should be used to remove all rubber residue from the cut. The prompt removal of objectionable dust will reduce wheel loading. •

• What are the common reasons for fishtails on parts run on a centerless grinder?

Fishtails are usually the results of small particles of abrasive suspended in the coolant. This could be the result of particles accumulating on the wheel guard and dropping on to the work. However, I would suggest filtering the coolant if the difficulty continues. See the series "Cleaning Grinding and Finishing Coolants" which started in the March issue of GRINDING and FINISHING.

Will changing the rate of traverse on a surface grinder during the clean-up change the finish?

Yes. It is common practice, when surface grinding either with a vertical or horizontal spindle to reduce the rate of traverse on the finish cut. Inasmuch as the leading edge of the wheel makes the initial contact with the work, it has a tendency to wear. Unless the wheel traverse is reduced to a rate where the wheel contact is continuous with the work, there will be a series of high and low spots on the surface. It is therefore customary to dress the wheel, restoring the wheel face, then with a reduced traverse and very light downfeed is the grinding operation.

Can there be too much coolant applied during the surface grinding of cast iron?

Sulphur treating of honing stones may result in performing several functions. The sulphur may lubricate the abrasive grains making it possible for them to function for a longer time before becoming dull and ineffective.

Sulphur treatment may also fill the voids of the stone reducing the grain penetration resulting in an improved finish. Stone loading might also be reduced.

What effect does the sulphur treating of honing stones have on the stone action and life?

Generally, it is impossible to apply too much coolant when surface grinding. If it is a vertical grinding job, there is likely to be a considerable amount of frictional heat generated by the large abrasive contact with the work. This is particularly true when wide rim segments are used. The more coolant here the better the control. Caution should be used in mixing the coolant as too high a concentration will cause the wheels to load, glaze and even generate additional heat.

THE EDITOR

Arthur Rakestraw, our question and answer editor, has spent 27 years as an abrasive engineer. Most of these years were spent in the Chicago area which is very diversified in grinding operations. A graduate of Purdue University, Rakestraw set up abrasive lines for five plants during World War II.

YOUR QUESTIONS ANSWERED!

Send your questions and problems to GRINDING and FINISHING. Your problems may be similar to many others so let's get them out in the open. Our new question and answer section will attempt to answer the bothersome detail problems as well as the major difficulties. Please include all the facts involved in your question.

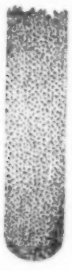
Allison-Campbell

ABRASIVE CUTTING KNOW-HOW

ACCO for Better Values

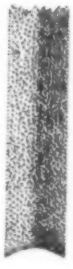
WHEEL EDGES TELL THE STORY!

NORMAL • *The right abrasive cutting wheel, properly applied, produces edges like these:*



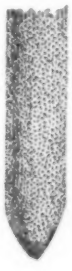
Slightly rounded edge is a sign of the right wheel properly applied to the cutting of solid bar stock up to 12 inches square. You'll get fast cutting and long wheel-life with the right abrasive cutting wheel.

A wheel which retains its **square edge** is well-suited to cutting both—solids, and structurals or tubing of medium wall thickness. A good general-purpose wheel is required for these mixed cutting operations.

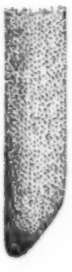


This **edge** is **slightly concave.** It should appear this way when you've used the right wheel to cut light tubing or other thin-wall sections. ALLISON wheels designed for this application make burr negligible.

ABNORMAL • *The wrong wheel, or improper application, produces edges like these:*



A **slightly pointed edge** means a wheel mismatched to the cutting job. A wheel which looks like this is too hard, doesn't break down uniformly. The tapering effect can produce wheel binding and breakage, and can burn the cut.



A "**chisel**" **edge** shows uneven wear, faster breakdown of the wheel on one side than on the other. It's the result of improper application of coolant in wet cutting. The result—shorter wheel life, and crooked cuts.

When the abrasive grain on the wheel edge wears smooth without being torn out, the **edge** becomes "**glazed,**" and the wheel loses its cutting efficiency. This condition is easily avoided by proper wheel application.

Abrasive Cutting Can Give You CLEANER Cuts—Faster

Cutting speeds of a few seconds per square inch, on almost *any* material, mean substantial time savings. Even titanium can be cut quickly and economically with the right abrasive cutting machine and wheel.

Fine finish obtained from abrasive cutting avoids burn, minimizes burr, and reduces or eliminates additional finishing operations.

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WRITE FOR NEW BULLETIN

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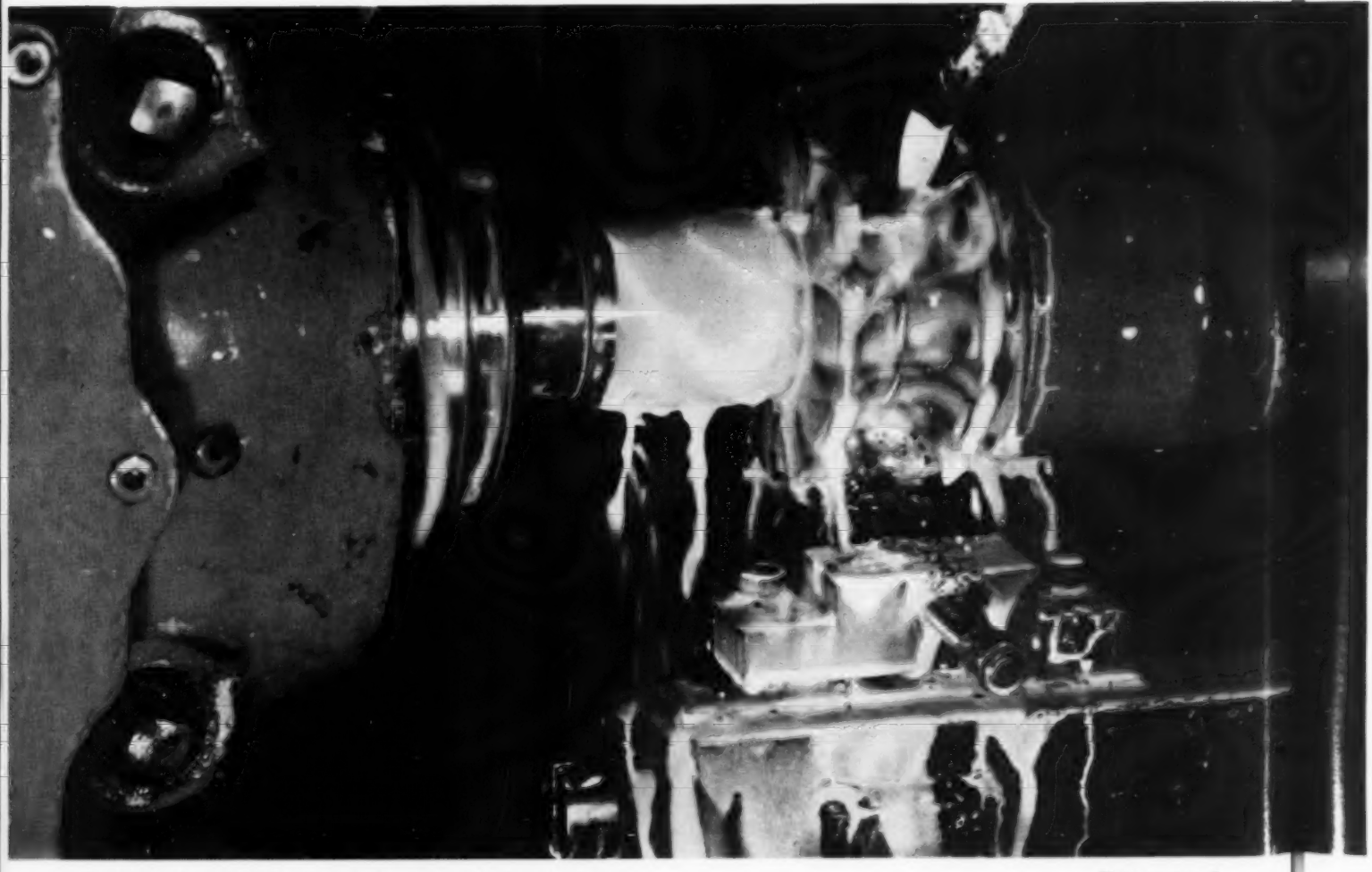
ACCO

Wheels and machines stay cleaner with emulsions of new S.E.C.O. Also, finishes are better.



Emulsions of new S.E.C.O. allow faster cuts with less tool wear.

Photos courtesy of Peter Salmon Co., Glenside, Pa.

NEW EMULSIFYING OIL KEEPS MACHINES CLEAN, PROTECTS AGAINST RUST, GIVES IMPROVED HARD-WATER EMULSION STABILITY

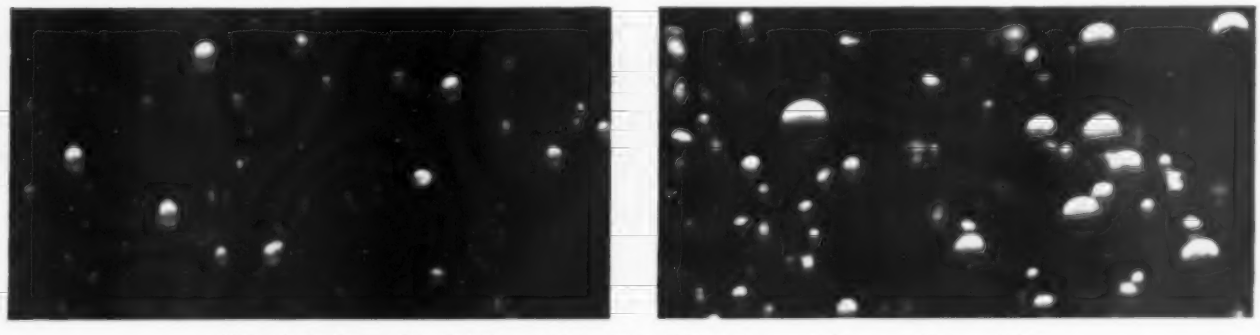
Emulsions of Sun's new S.E.C.O. (Sunoco® Emulsifying Cutting Oil) with smaller oil particle size give you the following benefits—

EMULSION STABILITY—In hard-water areas, impartial field tests show that emulsions of *new* S.E.C.O. stand up better under more severe conditions than those made with other regular emulsifying cutting oils.

DETERGENCY—The excellent wetting properties and detergency of *new* S.E.C.O. allow dirt and fines to settle quickly out of emulsions. Grinding wheels and machines stay cleaner.

RUST-PREVENTION—The smaller oil particle size in emulsions of *new* S.E.C.O. gives better metal wetting properties and increased protection against rust and corrosion. See photos below.

If you're a regular user of S.E.C.O., notice how much it has been improved. If you're not, find out what we mean about greater economy and improved production with *new* Sunoco Emulsifying Cutting Oil. Call your Sun representative, or write to Sun Oil Company, Philadelphia 3, Pa., Dept. I-9.



800x photomicrographs of 10% emulsions. *New* S.E.C.O. emulsion on left contains *8 times* as many oil particles per unit volume as ordinary emulsion on right. Many minute particles in S.E.C.O. emulsion do not show at this magnification.

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Blanchard grinding wheels, for use on Blanchard Surface Grinders, are made in cylinder, segment and sectored types. By selecting from a variety of vitrified, resinoid and silicate bonds and a number of different abrasives, Blanchard is able to make exactly the right wheel for every surface grinding job.

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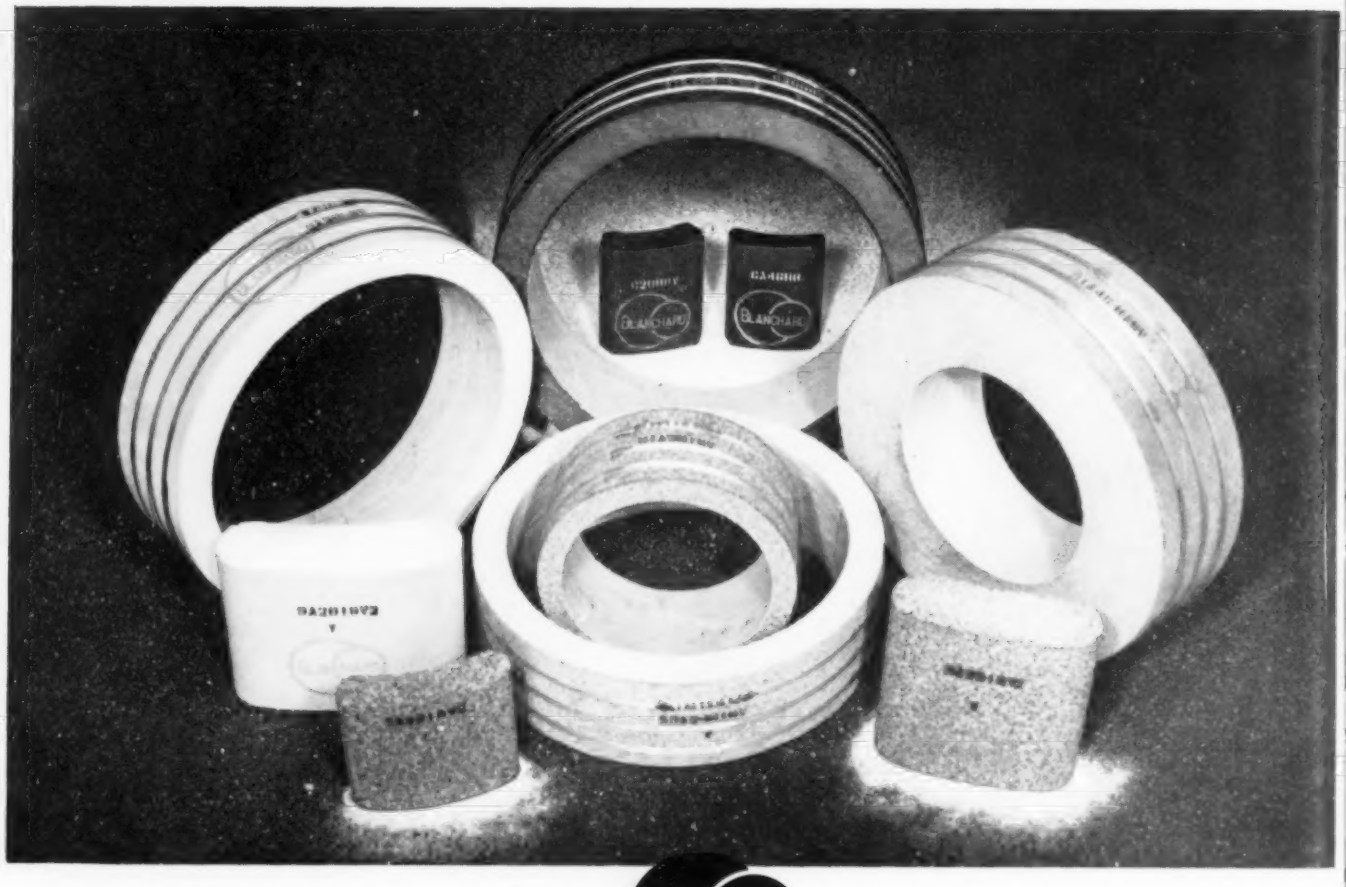

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Gentlemen: Please send me free copies of "Blanchard Abrasive Wheels and Segments" and "The Art of Blanchard Surface Grinding" (3rd edition)

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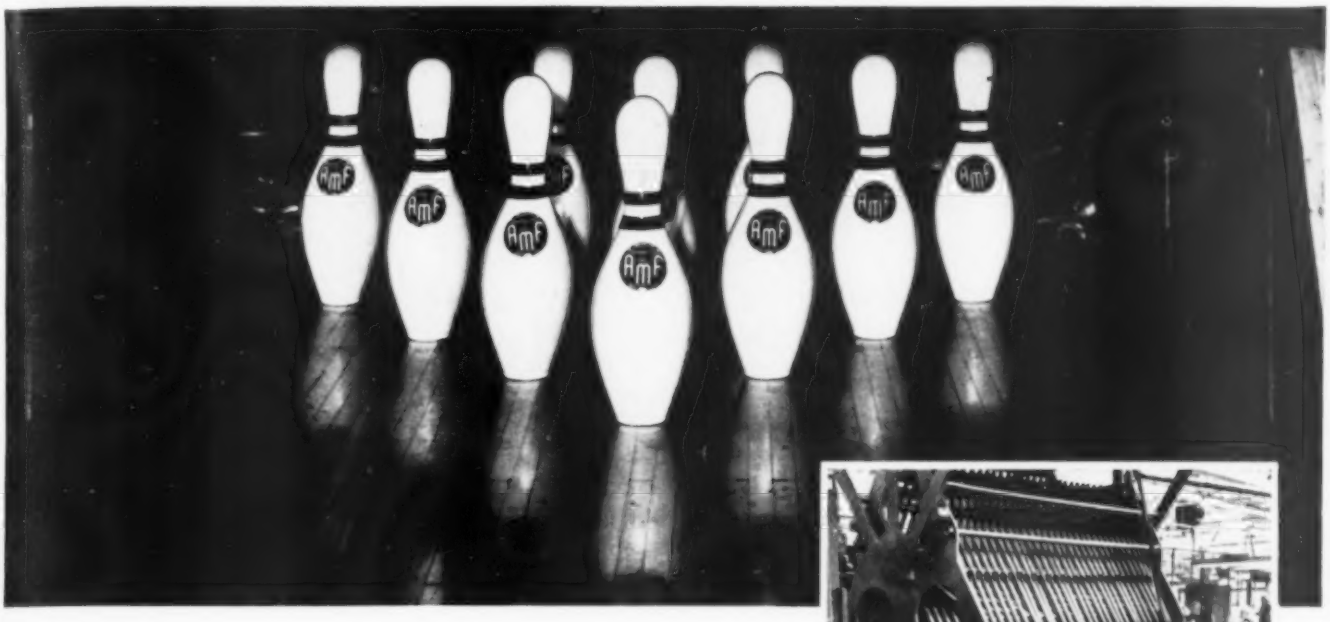
Report from AMF...Leading Manufacturer of Automatic Pinspotters:



At American Machine & Foundry's Buffalo plant, Almco barrel finishing equipment imparts a fine microinch finish to distributor tracks used in bowling's automatic pinspotter.

ALMCO Barrel Finishing Solves $37,000 Problem By Improving Finish On Track Mechanism

HERE'S HOW ALMCO BARREL FINISHING saves American Machine & Foundry Co. $37,000 a year on an intricate product — an automatic pinspotting machine!

The pinspotter — a fully-automatic unit for setting bowling tenpins — had developed an isolated problem spot: A nylon gear which meshed with the teeth of the distributor track was rubbing against microscopic rough spots and surface irregularities. This caused the gear to wear at a faster-than-normal rate.

IMPROVING THE TRACK FINISH by usual methods required about 70 minutes for each track. Cooperation between AMF and Almco engineers, however, resulted in a special "fixture" to hold 29 track units in an Almco Model DBF-800-48-1 barrel finishing machine.

Tracks now attain a 32 microinch finish at a time rate of 10 minutes each. Costs were cut $37,000 annually, and the complete Almco installation actually paid for itself in less than five months!

Do you have a finishing problem on large parts? Or do you have smaller parts that must be accurately deburred and polished? In either case, find out what Almco barrel finishing can do for you.

ALMCO'S TECHNICAL STAFF will examine your product parts and provide sample processing. You'll get a detailed report with recommendations. No obligation, of course. Send in your sample parts with specification requirements. Your Almco sales engineer can make the arrangements, if you wish.

Sample parts processing is conducted in this modern Almco test lab. Simply write on letterhead to request arrangements or send parts direct to Almco at Albert Lea, Minnesota. Enclose specifications required.

Send for Free Barrel Finishing Handbook

52 pages of case history facts and descriptions of barrel finishing processes. Detailed cost charts on finishing of typical parts. Send for your free copy today.

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135 Marshall Street • Albert Lea, Minnesota
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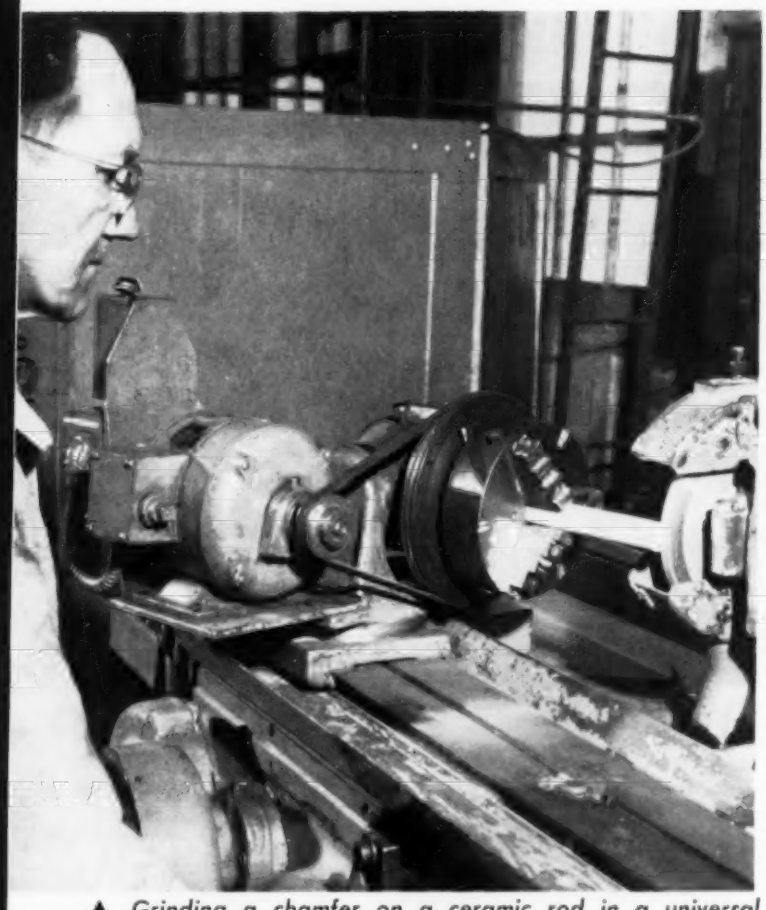
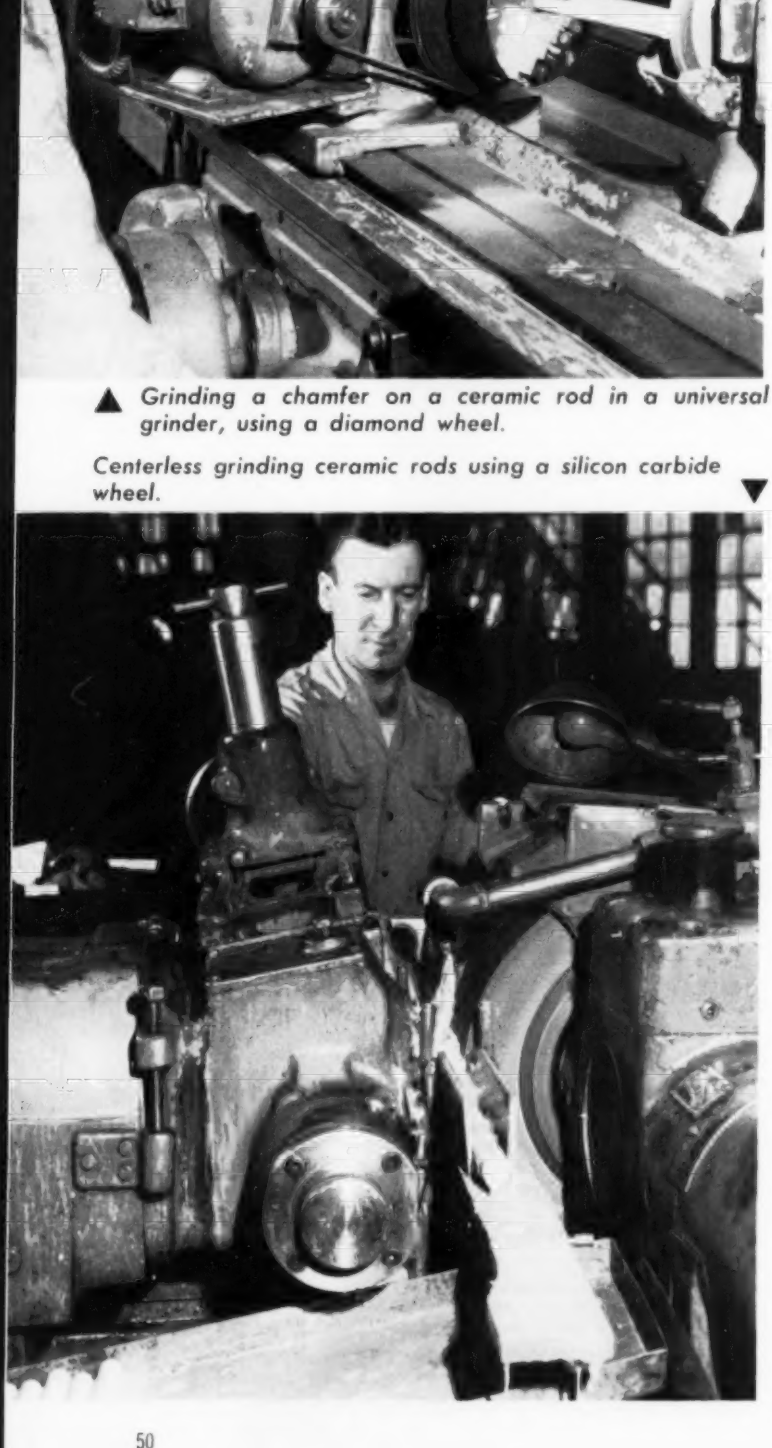
Sales and Engineering Offices in Chicago, Detroit, Los Angeles, Newark, New Haven and Philadelphia

IN ENGLAND: *Almco Division of Great Britain, Ltd., Bury Mead Works, Hitchins, Herts, England*



▲ *Grinding a chamfer on a ceramic rod in a universal grinder, using a diamond wheel.*

Centerless grinding ceramic rods using a silicon carbide wheel. ▼



Techniques In Ceramic Grinding

- *Selection of wheel most important.*
- *Type of ceramic must be taken into consideration.*
- *Machine design and condition important when using diamond wheels.*

by **E. L. Sinclair,** Product Engineer
Norton Company

Ceramic grinding is not essentially different from metal grinding. The same machines and the same general techniques are used. The problems which arise are also similar and in the case of grinding involve principally the selection of a suitable wheel specification.

Generally speaking, a concentration of 100 is recommended for fixed feed grinding in centerless, surface and cylindrical grinding. In cut-off operations and hand grinding operations, lower concentrations, such as 50, result in faster cutting.

As is the case in any grinding operation the material to be ground must be considered. The grinding of ceramics involves in general two types of materials. Pre-fired ceramics and ceramics softer than 800 Knoop hardness represent one condition whereas fired ceramics harder than 800 knoop hardness represent the other.

Examples of the first type include a great many parts made for the electronics industry such as spark plug housings, insulators and also ceramic rings. These are

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Mr. R. J. Terbrueggen, Media Director
Clark & Bobertz, Inc.
Detroit, Michigan

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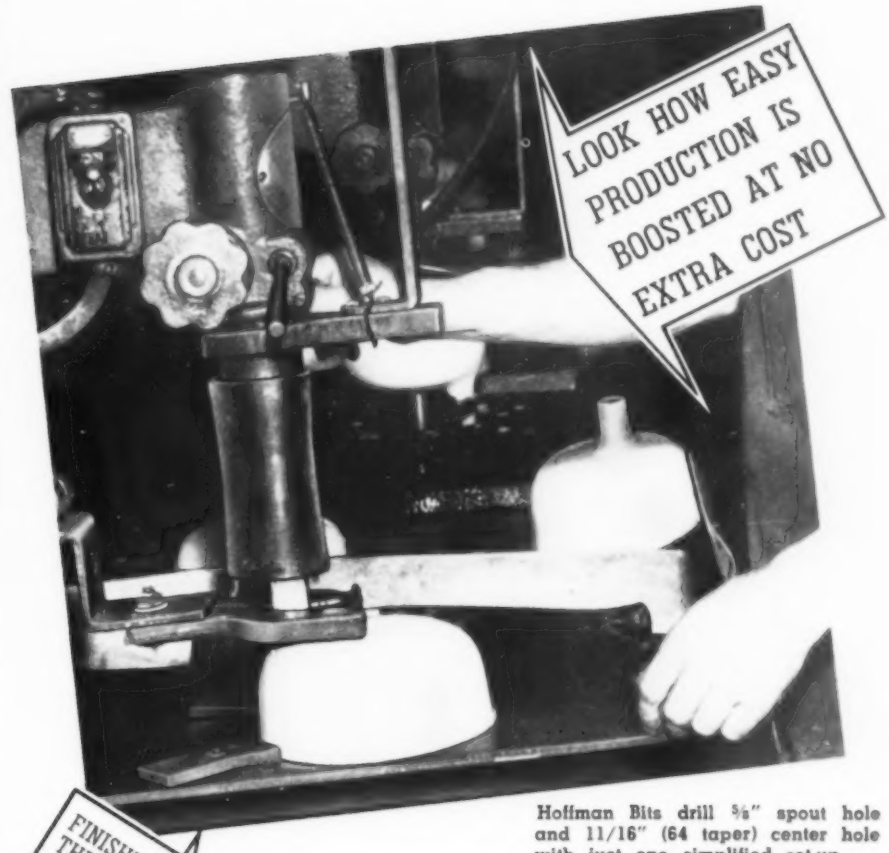

Hoffman Bits drill 5/8" spout hole and 11/16" (64 taper) center hole with just one simplified set-up.

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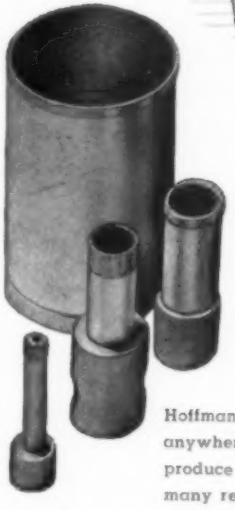

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often ground in the pre-fired state prior to the final firing. A principal advantage of grinding in the relatively soft state is the elimination of the need for diamond wheels in the forming operations of many of these parts.

Silicon carbide, vitrified bonded wheels are satisfactory for most of this work. For parts with an intricate form, it is often impractical to reproduce the forms on the face of a diamond wheel. Tolerances of a thousandth of an inch are easily attained on the softer ceramics using silicon carbide vitrified bonded wheels.

Two examples of the second and harder type of ceramics are radomes which cover rocket noses and ceramic cutting tools. These both have a high alumina content and the use of a diamond wheel is required for economical machining.

The selection of grit size and grade of the wheels is largely determined by the work being done. The type of abrasive is determined by the hardness of the work. Optimum grit size is governed by the area of contact between wheel and work, machine type as well as by finish requirements.

Cylindrical and surface grinding on a horizontal spindle, reciprocating table machine are considered line contact types of grinding. Surface grinding using a cup or face type of wheel will present an arc contact with the work and therefore greater contact area. As the contact area increases the unit pressure decreases. It is often advisable therefore to use larger grit sizes having greater chip clearances to improve cutting rate on the larger contact area grinding.

In the case of diamond wheels, diamond concentration is determined by weight; therefore, the coarser grit sizes provide a fewer number of diamond particles in the wheel face. It is usually advisable to use the coarsest possible grit size, commensurate with finish requirements, as the area of contact increases. A better finish with coarse grit size is easier to produce as the area of contact increases. Generally speaking, 100 concentration diamond is recommended for fixed feed grinding in centerless, surface and cylindrical grinding. In cut-off operations and hand grinding operations the lower concentrations, such as 50, result in faster cut.

Diamond wheels used for ceramic grinding are generally limited to metal bonded wheels. Normally slow cutting on other type materials, metal bonded diamond wheels are very successful on ceramics. Ceramics are relatively high in abrasion properties and the swarf, which is partially carried over with the coolant that recirculates, acts as a dressing medium to keep the wheel sharp and free cutting. Resinoid bonded wheels groove quite readily although they are used frequently for obtaining fine finishes. Occasionally we find a requirement for finishes in the range of 1 to 2 rms and these create problems in using metal bonded wheels because the diamond must be so fine that breakdown of the grinding face is excessive. With the resinoid bonded wheel, the wheel wear is sufficient to expose the new particles when the diamond is finer than 320 grit.

Up to now, low micro-inch finishes have not been required of ceramics to the same degree that they are in metalworking. Size tolerance seems to be the principal consideration in ceramics. A 15 rms is a typical finish required for a precision piece of ceramic.

A good example of a fine finish on a ceramic part is found in a steatite thread guide used in the textile trade. The finish must be fine to prevent the thread from snagging on the surface. In this case a finish of 3 to 4 rms was required. This is achieved by using

Cutting porcelain cylinder with a diamond wheel. The work is held between centers on a universal grinder.

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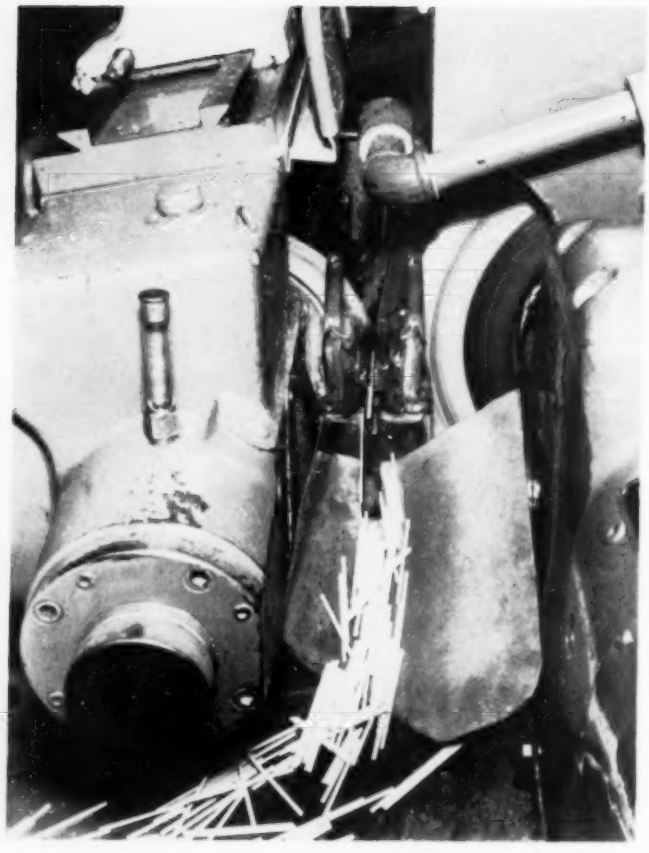


Steatite thread guides are centerless ground with a diamond wheel.

The most expensive diamond wheel with a list price of over $25,000. After almost three years, it's still going strong grinding the steatite thread guides.

Ceramic Grinding . . .

silicon carbide, shellac bonded wheels. Their purpose was to refine the surface left by a 150 grit diamond wheel. It's almost a buffing action.

This operation is interesting in another sense too. It involves the use of the most expensive diamond wheel ever made by Norton Company, and perhaps by anybody. At the time it was manufactured, it had a list value of over $25,000. This wheel, 20 inches in diameter, with a 6″ face and a diamond depth of ⅛″, is used on a centerless grinding operation, using a Cincinnati No. 2 Centerless Grinder.

Although this sounds like a high price to pay for a wheel, it was selected because it offered the lowest possible grinding cost per piece. This wheel operates normally three shifts a day, five days a week. So far it has been in operation 2½ to 3 years, on these steatite rods which are about ¼″ in diameter and 2 or 2½ inches long. Steatite is a high alumina, very dense ceramic. Millions of these parts are used annually in the textile trade and they must be made to close tolerance for ease of replacement in the looms.

Silicon carbide will grind ceramics but the decision to use it or diamond must be based on economics. When using silicon carbide wheels, the operator must make constant adjustments to compensate for wheel wear to maintain the required tolerance.

In one case history, a battery of 30 centerless grinders were in use, all with silicon carbide wheels. The customer felt this was a satisfactory process until he tried a diamond wheel. The diamond wheel was operated in one of the machines on a test program for 16 hours without the operator having to make a change in his settings to compensate for wear.

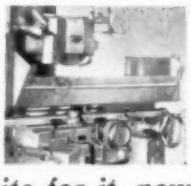
Ceramics are normally wet ground. Type of coolant is relatively unimportant; the primary requirement being a rust inhibitor in the water to protect the machine.

Wheel speed is also a factor. Recommended grinding speeds for ceramics are in the range of 5000 to 5500 s.f.p.m. for normal precision grinding. For cut-off work, we find that speeds a little higher, up to 7500 s.f.p.m. are more economical.

Machine design and condition is very important in using diamond wheels. We have found that most precision grinders built for metalworking are satisfactory as long as the spindle bearings are in good shape and that there is no vibration. Vibration is the most significant factor in high diamond wheel wear. Because of the inherent hardness of the diamond wheel, it has a tendency to pound itself to pieces in the presence of excessive vibration. Because of the high price of diamond wheels and the limited depth of diamond on the grinding face, it is not economical to true off a portion of it just to make the wheel run true on a faulty machine. In a manufactured abrasive wheel, this does not represent a serious problem. The price of diamond wheels justifies special attention to machine maintenance. • • •

and now . . . Abrasive "operator engineering" brings you —

AUTOMATIC CYCLING ON SURFACE GRINDERS

Grind precision work to size — *automatically* — like this: Simply set this down-feed increment from .0001″ to .0025″. Then, the head automatically down-feeds that amount each time these adjustable trips reverse the saddle, or if you wish, each time this table control reverses the table. When this micrometer stop, which you have set to finish size, contacts this micro switch, the down-feed knocks off and this red light flashes on. Then, depending upon how you have set this control, the grinder will automatically spark out 1, 2 or 3 times. Abrasive's cost-cutting automatic cycling is available on all Hydrabrasive precision surface grinders  which are illustrated and described in this colorful brochure. *Write for it, now!*

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Do the **BIG** jobs . . . and the small ones too on a **BRYANT**

No matter what your internal grinding problem may be, it can be solved effectively with a Bryant Internal Grinder.

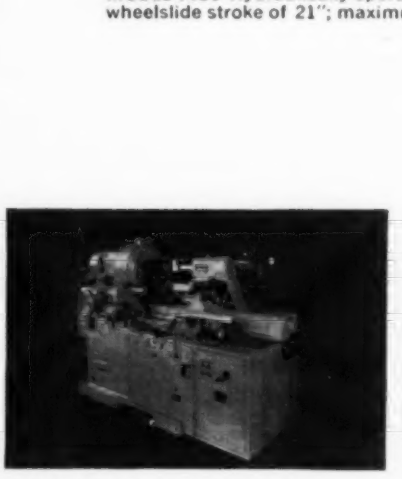
Bryant's great variety of manual, semi-automatic and automatic grinders is your assurance of a machine that is tailored to meet your production requirements.

Investigate how Bryant's engineering services can help you attain higher production at lower operating costs.

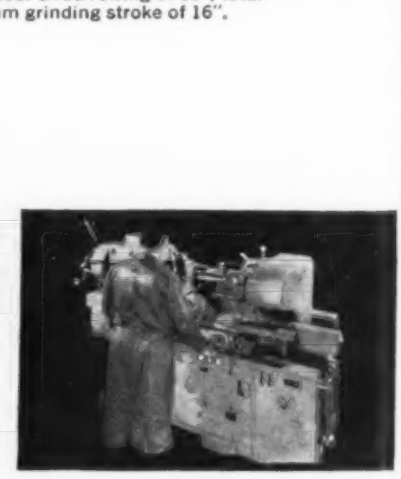
MODEL 1460 Hydraulically operated. Chuck swing of 60", total wheelslide stroke of 21"; maximum grinding stroke of 16".

THE "CENTALIGN", completely new in concept and design, is ideal for the long run, high production grinding of straight bores, tapers and bearing raceways. Maximum swing, 10", grinding stroke, 1".

MODEL 1109 A precision internal grinder, suitable for covering the range of smaller bore sizes. Total swing of 9"; maximum grinding stroke of 3½".



MODEL 1116 Tops for both toolroom and general production work. Total chuck swing 16"; maximum grinding stroke 8".



MODEL 1316-J Hydraulic Internal Grinder. For combined bore and face grinding. Two wheelheads on a single wheelslide provide exceptional speed, accuracy and versatility. Maximum swing, 16", maximum grinding stroke, 8".

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Free Literature

Use the postpaid card opposite page 88 to receive your copy of any of the literature listed on these pages. Just circle the proper number on the card which coincides with the number which precedes the paragraph. We'll do the rest.

1. Vitrified Bonds. Brochure on American K and KP vitrified bonds, for Aluminox grinding wheels and segments, reports success of these bonds since their introduction a year ago. The KP bond is recommended for surface grinding applications. The wheels cool as they cut, and hold form while giving fast stock removal. They are recommended for deeper, heavier, cooler cutting with less dressing. American Emery Wheel Works, Richmond Square, Providence 1, R.I.

2. Abrasive Belt Flat Finishing Machines are shown in bulletin 751. Flat work can be done with ease on these single and multi-head machines. They are available with heads to accommodate belts 6", 8", 10", and 12" wide. Hammond Machinery Builders, Inc. 1651 Douglas Ave., Kalamazoo, Mich.

3. Centerless Grinding Machine. The No. 1 Filmatic, rated at 7½ hp for the grinding wheel drive, features Filmatic bearings for the grinding wheel spindle. These bearings, consisting of three segments, automatically adjust for load and are reported to eliminate spindle flutter. Colorful booklet further states the machine handles infeed and thru-feed work up to 1½" diameter. Cincinnati Grinders Inc., Cincinnati 9, Ohio.

4. Electrolytic Power Unit. For the applications of electrolytic grinding that require large volume metal removal, an electronic-electrolytic power supply unit with output capacity of 1,000 amperes is now marketed. The new unit, as described in flyer available, is suited to surface grinding and cylindrical grinding where wheels from 1" to 3" wide are used and there is a large contact area between the wheel and the work. Anocut Engineering Co., 631 W. Washington Blvd., Chicago 6, Ill.

5. Diamond Traps. Folder defines Model 1-B as designed to by-pass aluminum oxide and silicon carbide to central system. It is used on machines that do a variety of grinding operations. Model 2-B is used on machines where diamond wheels are used exclusively. Air scoops are also discussed. American Industrial Diamonds, Inc., 6851 Chase Rd., Dearborn, Mich.

6. Cleaning of Coolants and Cutting Oils. Magnetic separators are offered for the removal of ferrous metal and non-ferrous solids resulting from machining operations. The clarification equipment is suited to any capacity central system. Filters provide removal of even sub-micronic matter. Folder obtainable from Infilco, Inc., Tucson, Ariz.

7. Engineering in Action at Allis-Chalmers is graphically told in words and pictures in the 36-page 1957 edition. Chapters cover research, power generator, nuclear power, power transmission and distribution, operations in Canada, Allis-Chalmers International and plant facilities. Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

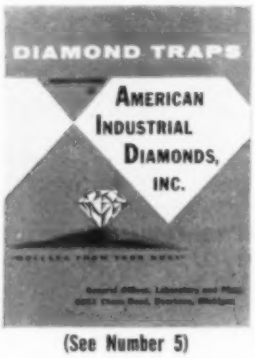
8. Sump Cleaners and Filters. Handling waste from machine tool coolant sumps are the Carnes portable sump cleaners and filters as defined in recent folder. Positive savings in less down time, cleaner machines and coolant re-use are claimed. Six models are available in 55 to 200 gallon capacities for air or electrical operation, all models complete with controls, hoses, and connections. Coolant Equipment Corp., Verona, Wis.

9. Pressure-Sensitive Tapes. The low friction, non-stick uses of Temp-R-Tape pressure sensitive Teflon tape and thermal curing, Teflon impregnated fiberglass tapes are covered in a two-page data sheet. The tapes cover an application temperature range of —100°F to 500°F. The Connecticut Hard Rubber Co., New Haven 9, Conn.

10. Slide Assemblies. The manufacturer offers a variety of standard, stock components for building up special machines and production equipment, according to recent catalog. The 132 models of slide assemblies come in a broad range of types and sizes, both light and heavy duty models, with sliding surfaces either milled or handscraped. Russell T. Gilman, Inc., 624 Beach St., Grafton, Wis.

11. Universal Grinder. Catalog I-57 describes and illustrates the Landis 10" type H universal grinder. It is reported to grind consistently to extremely close tolerances when required. Operators like the convenient location of the simplified controls, and ease with which set-ups can be

(See Number 2)



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FREE LITERATURE *continued*

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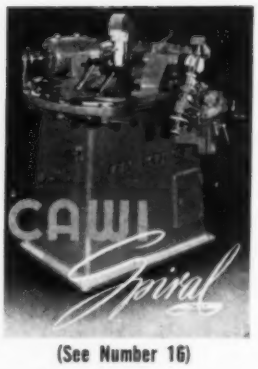

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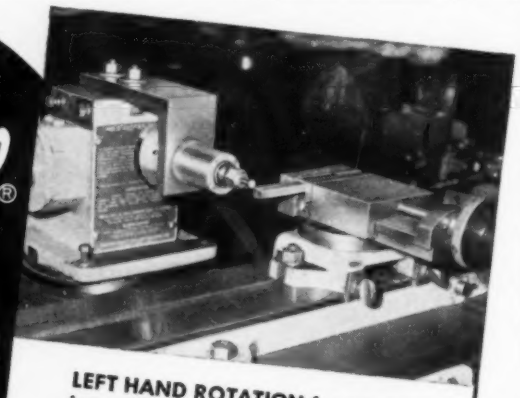
D1A-LH
air turbine
GRINDER



LEFT HAND ROTATION for grinding in same direction as standard machine grinder.

FITS SET-UP of machine dust collection system.

FOR INSTALLATION ON YOUR MILLING MACHINES AND GRINDERS. High speed, precision, air turbine grinder for such operations as slot and depth grinding, tool chip breaker grinding and cutter sharpening.

50,000 RPM air turbine drive

⅓ HP ample for all grinding wheel work resistances

always runs cool due to expanding exhaust air

Here's a precision air turbine grinder for milling machine or machine grinder mounting. Preloaded bearings control end play to 0.0002" tolerance. Left hand rotation duplicates machine spindle rotation for use with any standard dust collection system. Overloading can't hurt tool since it's an air turbine drive. Ample power for any type work. Pre-lubricated, grease shielded ball bearings.

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changed. Complete specs., with standard and extra equipment, are included. Landis Tool Co., Waynesboro, Pa.

12. Coated Abrasives. Recent catalog describes Armour-Clad abrasives for industrial use. Included are spiral wound bands for deburring irregular areas, and curved surfaces. Pyramid discs for grinding beveled edges are included also. Armour Coated Abrasives Div., Armour and Co., Alliance, O.

13. Universal Eccentric and Coordinate Head. Folder available describes the Unexko as an attachment which enlarges the scope of machine tools. It eliminates repeated setups and centering of workpieces. The combination of an accurate adjustable cross slide with incorporated spindle with indexing device and a scale of 360° allows easy production of eccentrics and pieces of complicated shapes. Alina Corp., 122 East Second St., Mineola, L. I., N.Y.

14. Micro-Weighing Instrumentation. The Cahn electrobalance gives balancing time of a second or two. Precision of the unit is reported at 0.02%, accuracy about 0.05% of full scale on each range. These features, among others, are given in folder obtainable. Cahn Instrument Co., 14511 Paramount Blvd., Paramount, Calif.

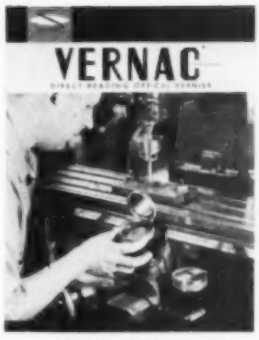
15. Tumbling Barrels. The Tumb-L-Matic multiple unit for wet or dry process, or combination of both, as discussed in bulletin No. MU-55, is designed for heavy production deburring, cutting down, and finishing of wood, plastic, and metal parts. The units are available with enclosed or open-frame construction. Flyer from Tumb-L-Matic, Inc., St. Marys St., Stamford, Conn.

16. Twist Drill Point Grinding and Thinning-Machine. The Cawi-Spiral is accounted as an entirely new system for grinding twist drills and many other two and three-fluted tools for drilling, milling, and counter-sinking in catalog available. Cawi Machine Co., Inc., 34 Exchange Pl., Jersey City 2, N.J.

17. Direct Reading Optical Vernier, the Vernac, indicates the longitudinal, lateral, or vertical position of any machining tool table, according to folder available. Readings are in 0.025" intervals on a hardened stainless steel precision scale. Simpson Optical Mfg. Co., 3200 W. Carroll Ave., Chicago 24.

18. Bed Knife Grinder. Advantages of the grinder, for servicing power mowers, fairway units, and a variety of straight-edge tools, are outlined in a folder released. Called the Ideal Model 50, the unit is said to grind bed knives of any size or shape quickly and accurately. The Fate-Root-Heath Co., Plymouth, Ohio.

19. Flute Grinder. Illustrated folder on the Blake flute grinder stresses the importance of uniform rake angle and accurate indexing. Any rake or hook angle can be exactly duplicated with the grinder, and spiral points of taps can be reground quickly. Edward Blake Co., Inc., 437 Cherry St., W. Newton 65, Mass.



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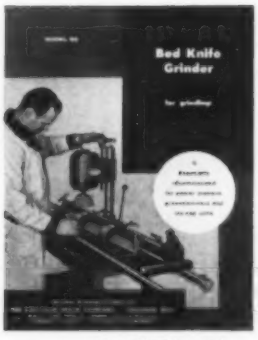


(See Number 18)

(See Number 19)

20. Creep Tester. The M-3 creep rupture tester, specially designed for laboratories which test smaller size specimens or use lighter loads, is described in illustrated brochure. Economy in floor space savings is emphasized. Arcweld Mfg. Co., P.O. Box 311, Grove City, Pa.

21. Rubber Hose. Eight new catalog sections on hose have been issued by the manufacturer. These cover most of the industrial types of rubber hose with detailed illustrations, data on construction, service, etc. The sections are: M610 Air, M620 Water, M630 Steam, M640 Water Suction, M650 Petroleum, M660 Industrial Fire, M670 Spray and Welding, M680 Special Service. Manhattan Rubber Div., Raybestos-Manhattan, Inc., Passaic, N.J.

22. "Stainless Steel Fabrication" is the title of a 386-page book, which has more than 140 photographs, 120 charts and graphs, and about 200 special diagrams on the making of this versatile metal into usable products. There is a section of almost 30 special reference tables on stainless steels. A detailed index for cross reference purposes is included also. Some of the chapter headings are: Cutting operations, joining operations, cold forming operations, etc. Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh 22, Pa.

23. Centers and Grinder Dogs. The 20-page catalog lists recently-added centers as anti-friction superaccurate and anti-friction bull and pipe grinder centers. Also included are new specs. and sizes for previously listed items. A group of special centers featured, for specific applications, are built-in spindle, self-floating, eccentric and chuck types. Red-E reversible grinder dogs are illustrated in steel and aluminum styles. Each classification listing has data for determining correct grinding machine tapers, gage line clearance requirements, and taper specs. for lathes. Ready Tool Co., 150 Garfield Ave., Stratford, Conn.

24. Filter Equipment. Illustrated catalogs offered are: The "General Products" catalog includes illustrations, diagrams, dimensions, etc.; the "Air Filter" catalog includes comparative charts on engine wear with Fram Filtronic air filters, and the "Filter Specifications" catalog includes oil and air filter cartridge cross reference, foreign vehicles cross reference, etc. Fram Corp., Providence 16, R.I.

25. High-Temperature Brazing Alloy. No. 21 data sheet describes new Nicrobraz 150 high-temperature brazing alloy, which presents such information as nominal composition, metallurgical properties, engineering properties, and application recommendations. Stainless Processing Div., Wall Colmonoy Corp., 19345 John R St., Detroit 3, Mich.

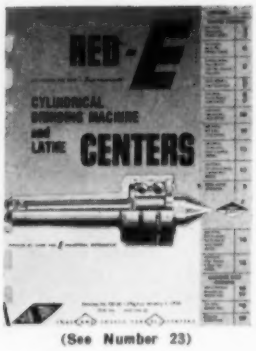
26. Burnishing Machines. Bulletin No. BB-55 describes the Tumb-L-Matic burnishing machines for wet ball burnishing jewelry and other small metal parts. Barrels are made in two types: specially treated hard maple, and also a molded barrel of high abrasion resistant material called Tumb-L-Dur. Machines have no projections inside to mar work being burnished. Finished parts go out of the machine in less than half a minute. Tumb-L-Matic, Inc., St. Marys St., Stamford, Conn.

27. Sleeves, Boots, and Way-Protectors. Round, square, and all combinations are designed to operate in angular, horizontal, or vertical positions. Gortite parts are fabricated from a neoprene-base material impervious to oil, grease, and water. In numerous use tests the parts wear from three to five times longer than ordinary, rubber, molded products, according to flyer available. A & A Mfg. Co., Inc., 712 S. 12th St., Milwaukee 4.

28. Air Chucks. A condensed catalog lists and prices a line of air-operated chucks, cylinders and accessory equipment. A matched, balanced, and standardized combination of aluminum body rotating air cylinders and air chucks has been made

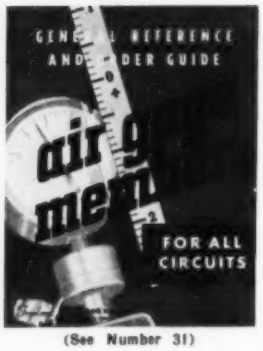
FOR High Speed CUTTING
TO AMAZING TOLERANCES
. . . The TY-SA-MAN 122-C
IF YOU CUT . . .
ALUMINUM
MAGNESIUM
TITANIUM
STEEL
IRON
COPPER
GRATING
PLATE
STRUCTURALS
STAINLESS STEEL
There's a Ty-Sa-Man Saw to Meet Your Needs
Ty-Sa-Man
Cut Your Inventory By Cutting Your Own Metal
Stock big sizes and cut it as you need it . . . that's the success story behind the Ty-Sa-Man saws that are paying big dividends to warehouses, fabricators and manufacturers from coast to coast. Best of all, when you cut it, in most cases, it's ready to use. The clean, square, accurate edges produced by this production saw need little or no machining or finishing work. This adds up to a saving of thousands of man hours, and just as important, saves the loss of waste metal.
Write For Free Catalog
MACHINE COMPANY
1016 WHITE AVENUE, KNOXVILLE, TENNESSEE

FREE LITERATURE *continued*



(See Number 23)

(See Number 28)



(See Number 31)

available for safe day-by-day operation of spindle speeds up to maximum rpm for metal cutting tools. The Cushman Chuck Co., Hartford 2, Conn.

29. Precision Disc Grinders. The **Gardner Grinder** for March is concerned with profitable job shop grinding with Gardner grinders. Included also is an item on special fixturing on the 2H30 grinder which handles large brake discs. Instruction is given on how to get best results when dressing and truing abrasive discs. Gardner Machine Co., Beloit, Wis.

30. Coolant Generator. A finer pin-point mist is now made possible by screw adjustment at the end of the nozzle, according to leaflet. Koolmist can be applied directly onto the cutting edges of tools, or from underneath when chips interfere. It saves taps and cuts cleaner threads. Applied to milling operations the generator keeps cutters cool. By eliminating dry grinding, wheel life is increased. Model No. 101 (less container) with clamp is $19.95, with other models priced according to gallon size of container and number of mist outlets. Lloyd Tool Corp., 912 Meridian Ave., So. Pasadena, Calif.

31. Air Gage Members. Catalog No. 357 features air gage instruments as air snap gage fixture which checks four diameters, and a multiple air fixture which checks eight diameters and out of round in two places. The manufacturer will recommend the gage he believes best suited to properly meet the job requirements of the customer. To assist the customer in ordering gaging members, the most commonly used air circuits have been divided into three types—back pressure, flow type, and differential type—and gaging members and air plug specs. for the specified type. Freeland Gauge Co., 9940 Freeland Ave., Detroit 27.

32. Magnesium Oxide. A bulletin describing the technical properties of electrical grade Magnorite fused magnesium oxide is available. This material, in grain form, is widely used in kitchen range surface units, immersion heaters, etc., because it has excellent electrical resistance combined with high heat conductivity. Norton Co., Worcester 6, Mass.

33. Diamond Compound. Four-page specification charts and price lists have just been issued. They cover diamond compound, diamond powder, boarts processing and diamond reclaiming. Diamond Dust Co., Inc., 88-19 76th Ave., Glendale 27, N.Y.

34. Grinders. Revised catalog B-57 of the 6" type CH and 10" type LCH plain precision cylindrical grinders is now available. The literature is well illustrated and contains complete specifications. Landis Tool Co., Waynesboro, Pa.

Announcing a
NEW HONING STONE
capable of polishing brass, bronze, aluminum and other soft metals to a
2-3 RMS FINISH
Bet You've Never Seen a Slicker, Mirror-like Finish!

Send now for full details and prices.

Superior Hone Corporation
1637 Elreno Street
Elkhart, Indiana

AUTOMATIC HONING MACHINES
MANDRELS
STONES

gf ... wherever abrasive operations are performed

New Equipment and Materials

For further information on any of the products listed here, use the handy postpaid card opposite page 88.

Precision Measuring Instrument

The vertical Wavometer increases the versatility of the standard Wavometer line, making it possible to measure surfaces of rotation up to 18" in diameter.

The instrument gives meter reading of the r.m.s. average height of the waves in two wavebands, directly in microinches (millionths of an inch).

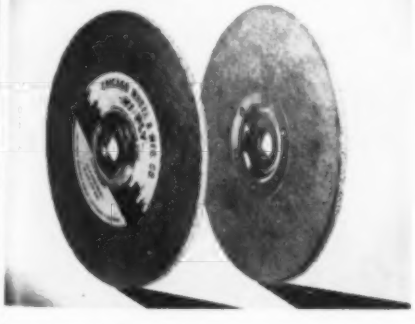
The instrument measures waviness on symmetrical surfaces of rotation, and is designed for use in production departments. It is simple to operate, and requires no technical knowledge or special skill.

Micrometrical Manufacturing Co., 345 So. Main St., Ann Arbor, Mich.

Use postpaid card. Circle No. 101

Extra Strong Grinding Wheels

The Chicago BR depressed center wheel shown embodies a novel metal center bushing said to impart extra strength and safety. This improvement



is a special safety measure providing for quick mounting with great accuracy on all types of disc grinding equipment.

The wheels are light weight, rigid type, reinforced resinoid bonded for use on portable disc type and right angle type portable grinders. They are made with a special metal center bushing in depressed center or raised hub shape in 7" and 9" diameters by 3/16" and ¼" thicknesses. Their use is for rough, tough production grinding, especially for grinding welds, removing flash and bead, cleaning up rough ragged surfaces and edges on all types of stainless steel.

Chicago Wheel and Manufacturing Co., 1101 West Monroe St., Chicago 7, Ill.

Use postpaid card. Circle No. 102

Oscillating 10" Duplex Grinder

The Hammond Model SCE-10 duplex oscillator has two tables mounted on ball bearing ways, which are arranged so that grinding can be done on both sides of the diamond wheel at the same time. Also, one table can be loaded while the other is in the grinding position. Angular setting with hand wheels range from 10° above to 25° below horizontal with no movement of the tables toward the wheel. Each table has replaceable wear plates and an area of 10½" x 15½" including the sliding wings. The wings support offset tools and push out of the way in case the wheel stroke should be increased. A guard on each side of the wheel can be removed for offset grinding.

Each table is actuated by an air cylinder including a pressure gauge, solenoid valve, filtering and lubricating equipment. The amount of infeed is determined by a micrometer screw with hardened stops and a dial calibrated to .001". The grinding time is controlled by an electric timer calibrated in seconds, which automatically retracts the table at the end of the grinding cycle. The cycle is started with a pushbutton and can also be retracted at any time with a pushbutton.

The wheel oscillation has two variables—both controlled by hand wheels. One is the stroke length from 0 to 1½" for up to 2" tools. The other is the stroke frequency that ranges from 0 to 115 per minute.

The machine mechanizes grinding, relieving the operator of fatigue and providing a radically increased rate of grinding. According to the firm, the electrolytic process reduces the consumption of diamonds by 80% to 90%, which savings, combined with great grinding speed, offer a great reduction in the cost of production carbide tool grinding.

Hammond Machinery Builders, Inc., 1614 Douglas Ave., Kalamazoo, Mich.

Use postpaid card. Circle No. 103

FAST . . . ECONOMICAL . . . VERSATILE . . .

ENGELBERG

Multiple-Head, Conveyorized Abrasive Belt Grinders

TWO-HEAD GRINDER For two operations in one pass.

FOUR-HEAD GRINDER Finishes four operations in one-fourth the time.

SIX-HEAD GRINDER Performs six operations in a single pass.

Pioneered and developed by Engelberg, the multiple-head, conveyor-type abrasive belt grinder is the modern production method of stock removal and finishing. Machines are available with from one to six or more heads.

From rough grind to final polish in a single through-feed pass the Engelberg groups finishing, sizing and polishing operations which might otherwise require several machines and operators.

Parts can be conveyorized or hopper-fed to machine's conveyor belt, and automatically ejected. Minimum set-up and change-over time add production dividends in both short and long run operations.

Whatever your grinding need, you'll find an Engelberg machine to fit it.

Send for your copy of this

FREE BOOK

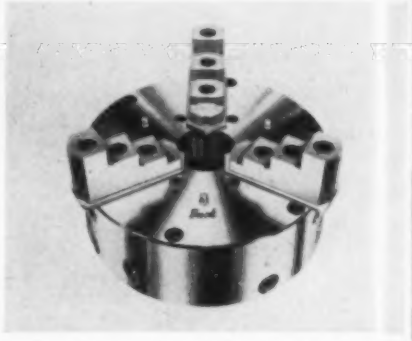
"How Abrasive Belt Grinding Increases Production at Lower Cost."

THE ENGELBERG HULLER CO., INC.

182 Seneca St., Syracuse, N. Y.

Precision ABRASIVE BELT GRINDERS

Dust-Proof Universal Scroll Chuck



Dead true precision on single parts, and precision within .0005" on duplicate parts is claimed for the scroll chuck with center hole.

The conventional bushing around the center hole that seals off the internal keyway ends, and the unconventional Buck dust plates that efficiently seal off the slots under the jaws, help make the chuck dust proof.

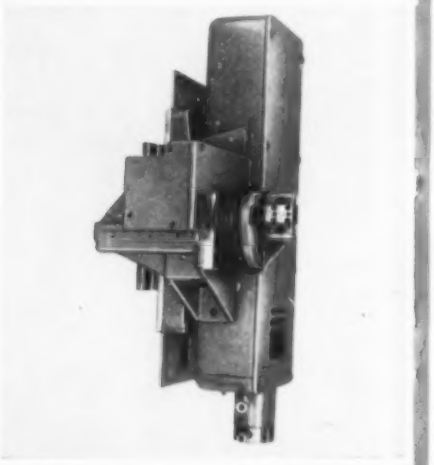
Chucks come in 6", 9", and 12" dia. sizes.

Buck Tool Co., Kalamazoo, Mich.

Use postpaid card. Circle No. 104

Wheel Dresser for Surface Grinders

Model 105 hydraulic contour wheel dresser, designed for convenient location in the water pan of surface grinders, features automatic hydraulic operation, either from the grinder's hydraulic system or from a separate power



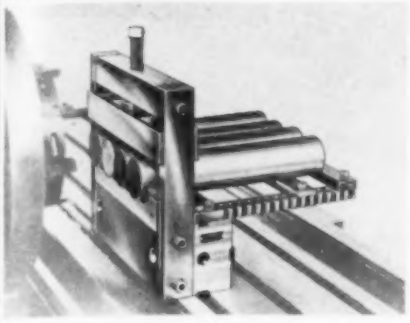
unit. Operation is tied into the grinding cycle. The unit features a continuous uninterrupted cut across the wheel, producing a perfect blend of all radii and tangents. Continuous coolant is used for long diamond life.

The wheel dresser accuracy is enabled by an inclined plane cam mechanism. Master contour templates are quickly interchangeable so jobs may be easily changed. Diamonds are optically pre-set in a microscope fixture so that no dresser readjustment is necessary during diamond replacement.

Hoglund Engineering & Mfg. Co., 343 Snyder Ave., Berkeley Hts., N.J.

Use postpaid card. Circle No. 105

Gang Fixture



Rigidly permits using carbide tools.

The new Lassy gang fixture has built into it a number of features for accurate, efficient milling and grinding a number of pieces at the same time. Compensating jaws clamp each individual workpiece with equal pressure, even though the pieces may vary in size by as much as 1/32". The springless clamping is positive and constant, and may be controlled to suit the workpieces or operation.

The model uses a conventional screw lock, but the fixtures can be adapted for either air or hydraulic locking. The fixtures can be used vertically or horizontally.

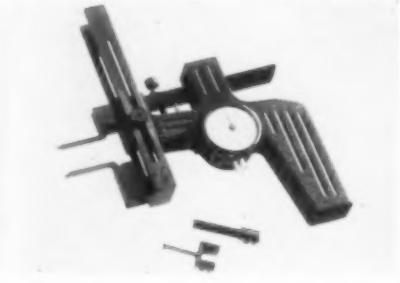
The entire fixture is designed for hard service and fast production. All parts, but the main body, are hardened. All parts are ground to ten-thousandths for certain interchangeability, and adjustable work stops are provided for accurate gaging.

Model GF-2 holds from four 2" round, square or oblong pieces, down to 128 1/16" pieces. Jaws for flat pieces hold up to 8" total lengths of any divided widths.

Lassy Tool Co., Plainville, Conn.

Use postpaid card. Circle No. 106

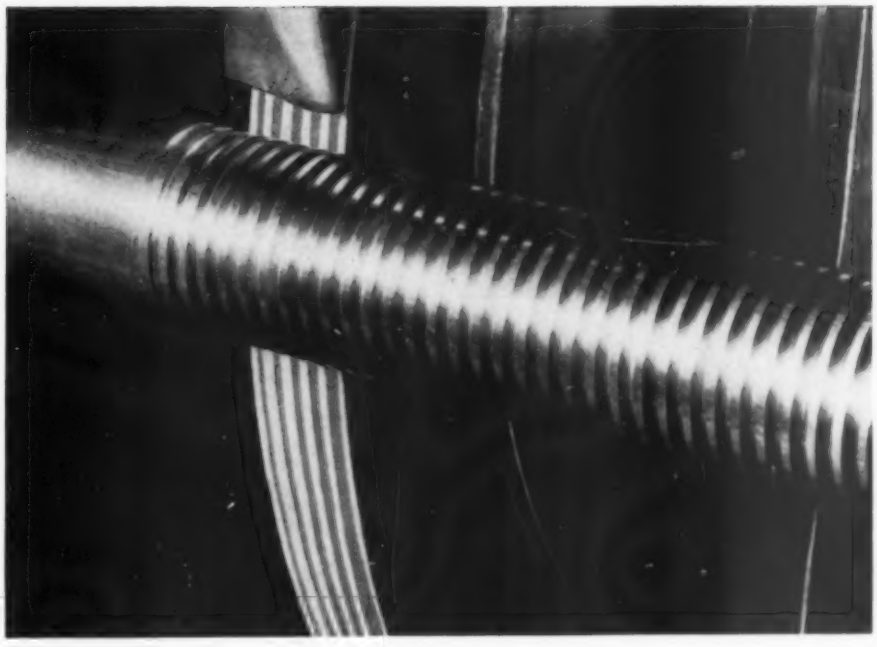
Inside Measurement Gage For "O" Ring Grooves



The precision groove gage, for "O" ring grooves and snap ring grooves and bores, has adjustable measuring pressure arrangement. The instrument repeats to unusual close dimensions, it is said, making it ideal for close tolerance inspection. Measurement range is from .137 to 6.875.

Mueller Laboratory, 1052 No. Allen Ave., Pasadena, Calif.

Use postpaid card. Circle No. 107



W & B *Base permits profitable grinding of Acme threads*

IN ONE PASS FROM THE SOLID . . .

with a diamond-dressed, vitrified wheel

Universal Thread Grinding Company, Bridgeport, Conn. developed a new method to cut costs and improve accuracy in grinding 5-pitch Acme lead screws. Threads are ground from the solid in a single pass, using a multi-rib vitrified wheel that is dressed to its intricate shape by a template-controlled diamond. The grinding fluid contains a high concentration of White & Bagley HTG Base and is fed under pressure.

Mr. Frank M. Linley, Jr., Partner in Universal, reports that production equals that possible with resinoid wheels, and results in several impressive savings . . .

"Souping-up our blending oil as much as 1-to-1 with HTG Base makes the new method possible", says Mr. Linley. "It improves cutting action, and the wheel holds shape much longer between dressings . . . in fact wheel life is extended 2 to 3 times. Diamond-dressing the vitrified wheel for steep-sided Acme threads is much easier than with resin-bonded wheels, of course . . . more flexible and less expensive than crush dressing. We've been able to extend diamond life about 5 times. Quite a saving at $20 per diamond, not to mention the saving in down-time!"

Mixing White & Bagley HTG Base with petroleum oil is the economical way you can obtain better custom blends for a wide variety of machining operations. Send the coupon below for complete information.

W+B INDUSTRIAL LUBRICANTS

THE WHITE & BAGLEY CO.

Worcester, Massachusetts • Detroit, Michigan

Originators of Grinding Lubricants

Sulphurized Fatty Bases
Grinding Coolants and Lubricants
Cutting, Grinding and Honing Oils
Forging Compounds

THE WHITE & BAGLEY CO., 88 Foster St., Worcester, Mass.

Please send me complete information on W&B HTG Base.

NAME ..... TITLE .....

COMPANY ..... STREET .....

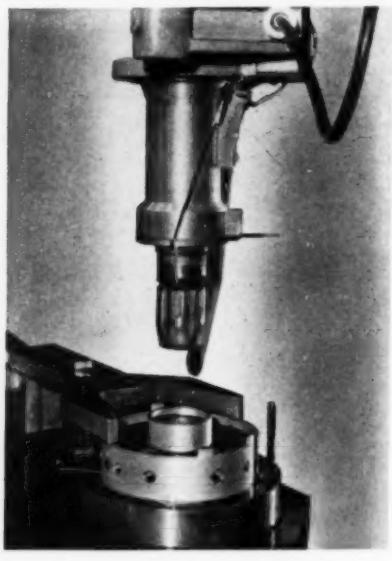
CITY ..... STATE .....

☐ Attached letter describes particular problem on which we'd like advice.

Why MICROHONING

Provides Lower Cost — Consistent Accuracy — Maximum Production

Success of modern mass production invariably depends on complete interchangeability of parts. Thus, processing procedures that provide consistent accuracy at high production rates are required—Microhoning machines having automatic Microsize gaging assure "all parts are created equal" at a faster rate and at lower cost.



The variety of work piece and processing factors that influence automatic sizing are too diversified to be encompassed by a single gaging technique. Thousands of Microhoning applications have verified this fact. Therefore, through its continuing program of research and development, Micromatic has designed several automatic gaging devices—each provides advantages for specific types of use. Typical of features to be found in Microsize controls are the following two examples:

EXPANDING GAGE MICROSIZE

1 Gage wear held to a minimum—gage enters work collapsed.
2 Fine size adjustment through a range of .010" on diam.
3 Geometric accuracy—free-floating tool and/or part.
4 Diametric accuracy—.0003" or less.
5 No limit on maximum bore diameter to be gaged.

GAGE RING MICROSIZE

1 Simple to operate and maintain.
2 Geometric accuracy—free-floating tool and/or part.
3 Diametric accuracy—.0003" or less.
4 Gages bores from .120" to 4" diam.
5 Only honing tool enters bore—nothing to mar finish of soft surfaces.

The real answer to efficient automatic gaging is found in applying the right gaging technique to each job—it is here that Micromatic "know-how" can be of vital service to you.

Learn why Microhoning will give efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

NAME_____

TITLE_____

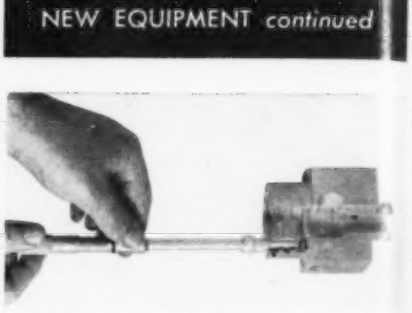
COMPANY_____

STREET_____

CITY_____ ZONE____ STATE_____

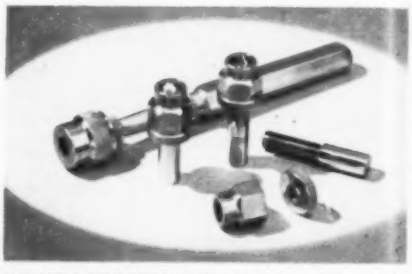
MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

NEW EQUIPMENT *continued*



MULTIPURPOSE MICROMETER, the Multi-Mike, measures both internal and external metal cuts and grooves quickly and accurately. Of use to precision machinists and quality control inspectors, it measures width of O ring and retaining ring grooves, keyways, cylinder grooves and lands between grooves. Measurement of grooves can be accomplished in holes as small as .550 of an inch in diameter. Consolidated Aircraft Products, El Segundo, Calif.

Use postpaid card. Circle No. 108



DIAMOND DRESSING TOOL, the Nesentwin, to be used for rough dressing, consists of a ring dresser heavily impregnated with uniformly graded multiple sharp diamond particles. It holds within its center a movable, easily adjustable single point diamond dressing tool, intended for the final pass. Nesen Diamond Tool Corp., 111 Lake Ave., Tuckahoe 7, N.Y.

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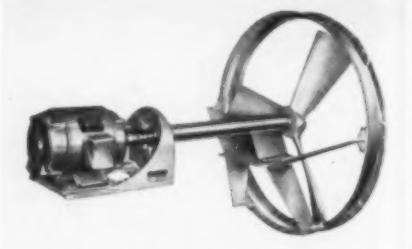
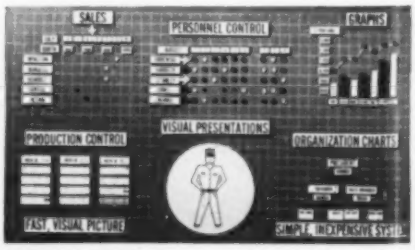


AXIAL FLOW EXTENSION SHAFT FANS have been designed for exhausting contaminated fumes from hoods or tanks, spray booth exhaust, and other installations requiring isolation of the fan motor from the air stream. Propellair Div., Robbins & Myers, Inc., Springfield, Ohio.

Use postpaid card. Circle No. 110



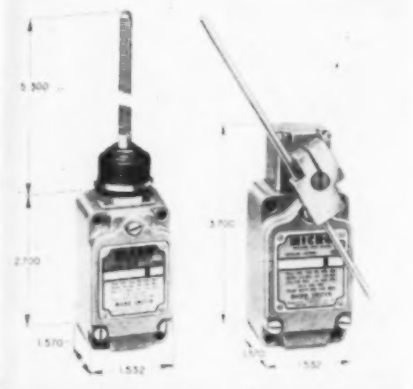
CONTROL BOARD, the Magne-trol, provides visual records flexible enough to be applied to any problem. The unit consists of a magnetic steel board which holds firmly on its surface the visual elements that compromise the needs of the user.

The manufacturers are offering a novel Trial Kit at the cost of manufacturing. It is basically the visual control board in miniature, accompanied by all the magnetic elements made available. The purchase price will be refunded in full within thirty days if the customer is not satisfied. Methods Research Corp., 434 Mosel Ave., Staten Island 4, N.Y.

Use postpaid card, Circle No. 111

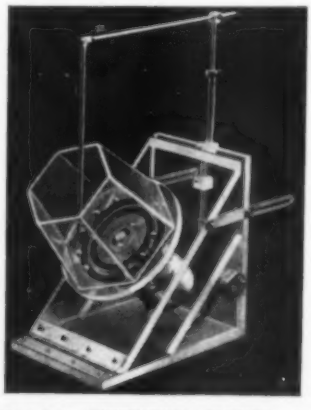
VARIABLE HEIGHT LOADING DOCK, the Portelvator, is said to maintain constant level with truck beds and may be positioned and removed from position by overhead crane. Load capacity is ten tons. Safety is assured by a limit switch. The Hamilton Tool Co., 9th St. at Hanover, Hamilton, Ohio.

Use postpaid card, Circle No. 112



SMALL-SIZE, TWO CIRCUIT LIMIT SWITCHES are reported to have the capacity to handle electrical loads usually assigned to much larger switches. Actuator versions covered are: the roller arm, flush-mounted roller arm, low force rod, flexible coilspring, in-line plunger, and roller-plunger. Micro Switch, Freeport, Ill.

Use postpaid card, Circle No. 113



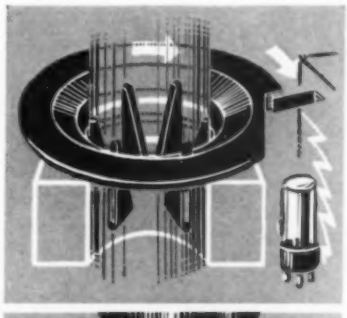
CYLINDER FOR BURNISHING, PLATING. Designed for low cost finishing of samples and small lots. The hinge-mounted drive tilts back for plating with the cylinder in oblique position; adjusts for burnishing with the cylinder in the horizontal position. The cylinders hold most any plating solution. Belke Mfg. Co., 9440 N. Cicero Ave., 51, Ill.

Use postpaid card, Circle No. 114

How MICROHONING Provides Lower Cost – Consistent Accuracy – Maximum Production

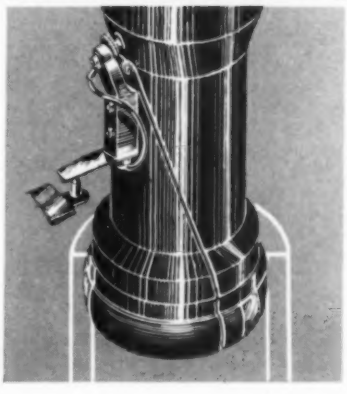
Inherent characteristics of the Microhoning process are: rapid stock removal —generation of geometric and dimensional accuracy—ability to produce any desired functional surface finish. By using automatic Microsize controls, Microhoning's economies for precision processing can be fully utilized.

Today, there are several different types of automatic Microsize gages. The type best suited for individual applications can only be determined by considering the workpiece and processing factors. How automatic cycling of Microhoning machines is accomplished by using Microsize gages is indicated by the following typical examples:



GAGE RING MICROSIZE

The gage ring, which is mounted above the workpiece, has an I.D. equal to required bore diameter. When bore has been Microhoned to size, plastic tabs on the abrasive sticks contact I.D. of gage ring causing it to turn. This movement triggers an air switch or an electronic pickup to initiate the ending of Microhoning cycle. Production-proved diametric accuracy on bores from .120" to 4" in diameter is .0003" or less.



EXPANDING GAGE MICROSIZE

This gage reciprocates in synchronization with the Microhoning tool but is not attached to it. Entering the bore on every downstroke of the tool, the gage expands only at the bottom of each stroke. When gage expands to required bore diameter, two preset electrical contacts meet and initiate the ending of Microhoning cycle. There is no limit on maximum bore diameter that can be gaged—diametric accuracy held to .0003" or less.

To most efficiently meet each automatic sizing requirement, Micromatic employs a wealth of experience in the use of air, liquid, electronic and mechanical controls.

☐ Please send me your movie "Progress in Precision" in time for showing on_____(date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

NAME_____
TITLE_____
COMPANY_____
STREET_____
CITY_____ ZONE_____ STATE_____ K

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

HIS JOB

....TO BUILD
YOUR PROFITS!

THE *Roto-Finish* CUSTOMER'S MAN

There's nothing unique about stressing product quality. But, at Roto-Finish we have an added incentive. The success of the Roto-Finish Customer's Man *depends* on providing the kind of dependable, mass-production finishing service which builds customer satisfaction, and results in a steady repeat business.

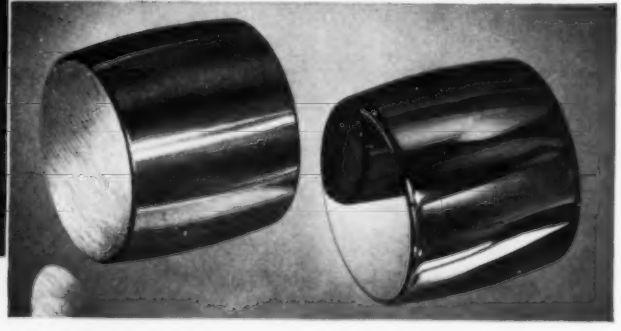
TRIAL AND ERROR FINISHING IS COSTLY

If you're now barrel finishing, our Customer's Man will welcome an opportunity to work with you in your own plant to show you how to get the finish you want, faster, and at lower cost.

If you're hand finishing, he can show you how to save up to 80% of your present finishing costs.

WANT PROOF? Then write or phone your Roto-Finish Customer's Man today.

ROTO-FINISH CASE HISTORY



*This photo is unretouched.

MATERIAL: Bearing steel, 61 Rockwell C Scale.
DIMENSIONS: 1.213" dia. x 1.015".
FINISH BEFORE: Ground to 10 RMS.
FINISH AFTER PROCESSING: 2 to 4 RMS, *(with no dimensional change).*

Roto-Finish COMPANY

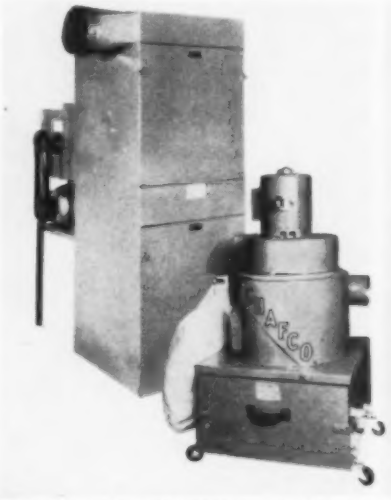
3730 Milham Road
KALAMAZOO, MICHIGAN
Phone: Fireside 3-5578

ROTO FINISH

FOREIGN REPRESENTATIVES: ARGENTINA—Taller—Buenos Aires ● AUSTRALIA—A. Flavell Ltd.—Cheltenham ● BRAZIL—Commercial E. Industrial de Fornos Werco, Ltd.—Rio de Janeiro ● CANADA—Canadian Hanson & Van Winkle Co., Ltd.—Toronto ● ENGLAND—Roto-Finish Ltd.—Hemel Hempstead ● FRANCE—Societe Roto-Finish—Paris ● GERMANY, AUSTRIA, NORWAY, SWEDEN, SWITZERLAND—Metallgesellschaft A. G.—Frankfurt, a. M.—Germany ● HOLLAND, BELGIUM, LUXEMBURG—N. V. Roto Finish Maatschappij—Delft, Holland ● ITALY—Societa Roto-Finish a R. L.—Milan ● SPAIN—Instituto Electroquimico, S. A.—Barcelona

VIBRATION TEST EQUIPMENT consists of a high frequency electro-dynamic vibration exciter, electronic amplifier and power supply, and a vibration meter and oscillograph. Vibration tests can be carried out at temperatures from —65° to +160° F. Bowser-Morner Testing Laboratories, Inc., 141 Bruen St. at Scott, Dayton 1, Ohio.

Use postpaid card. Circle No. 115



PORTABLE DUST COLLECTOR, called Model A-1 Spiraclone, is a compact unit weighing only 70 lbs. Dust laden air is drawn through a 4" inlet at 4800 lineal fpm. Dust particles are separated by powerful centrifugal force, and retained in enclosed dust pan. Priced at $175.00. Illustrated is Model 312, with 5000 cfm cap. Chicago Air Filter Co., 3723 Grand Blvd., Brookfield, Ill.

Use postpaid card. Circle No. 116

Surface Grinding Machine

The No. 510 surface grinding machine features a new Oriflex drive spindle which is capable of utilizing the full overload of the IHP spindle drive motor without slippage, or a direct motor drive spindle, a spindle unit mounted in a long bearing spindle slide and an elevating handwheel at eye level with wide spaced graduations in increments of 0.0002".

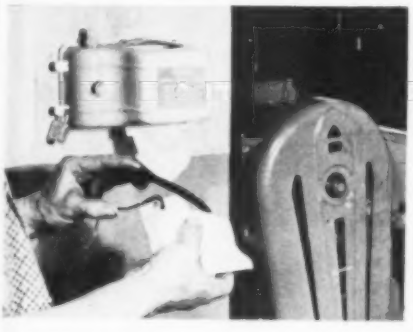
The table glides on precision ground and lapped straight rollers forming 90° V and flat guide ways, by lever control. The table level is adjustable to any convenient operating position. The full table travel of 11" is attained by moving the table lever 180°. The lever moves the table through a steel tape for extreme smoothness of motion and contributing to fine finish.

To insure the accuracy of every machine, the manufacturer checks for waviness on a 6" block. The limit established is that the depth of wavi-

ness must not exceed 0.000010" on this 6" block. Charts are made through the use of a recorder and contour meter, and then are filed.

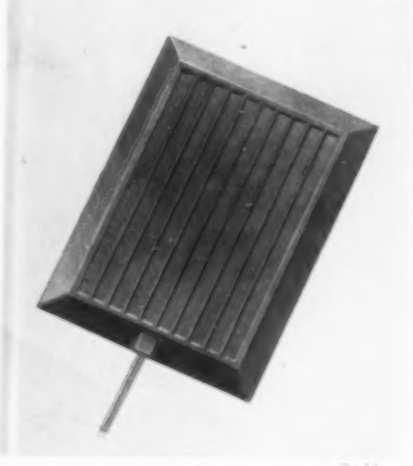
Brown & Sharpe Co., Providence 1, R.I.

Use postpaid card. Circle No. 117



M-S-A GOGGLE CLEANING STATION is easily mounted on wall or machine so it stays right on the job with the workman. Lenses are cleaned with Fogpruf spray and cleaning tissue. Mine Safety Appliances Co., 201 N. Braddock Ave., Pittsburgh 8, Pa.

Use postpaid card. Circle No. 118



ELECTRICAL FOOT SWITCH, called Neptune, can be submerged in water for either operation or cleaning. The switch electrodes are embedded in a flexible vinyl plastic which is highly resistant not only to water but to oils, greases, and most other common chemicals. The Recora Co., Inc., 6100 S. Archer Rd., Summit, Ill.

Use postpaid card. Circle No. 119

but TORIT Dust Collectors protect your workmen and build good morale

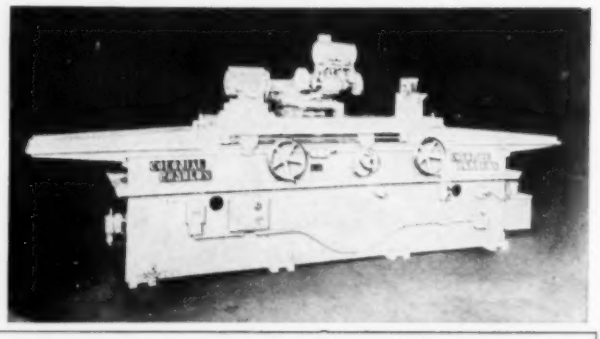
Clean working areas make healthier, happier, *more productive* workmen. Torit Dust Collectors trap dust before it irritates workers. Unitized Torit Dust Collectors are completely portable—cost a fraction of central built-in units and are not limited to particular areas. In addition, Torit Collectors save heat by recirculating clean filtered air.

Free descriptive handbook describes all models and applications. Write today to . . .

TORIT MFG. CO. Department 508 311 Walnut Street Saint Paul 2, Minnesota

Grinder Sharpens Half-Ton Cutter Assemblies

A universal tool and cutter grinder has been designed for the economic sharpening of large and heavy milling cutter assemblies to original form and original cutting effectiveness. It enables a plant to do its own milling-cutter assembly sharpening with ease and precision The machine will grind either high-speed steel or carbide-insert milling cutters.



Straight and helical flutes on outside diameters, radial faces and end faces can be ground on the machine. The OD's can be cylindrical, tapered or contoured. Accuracy of the unit is to 0.001" runout of all working surfaces in grinding outside diameters up to 18".

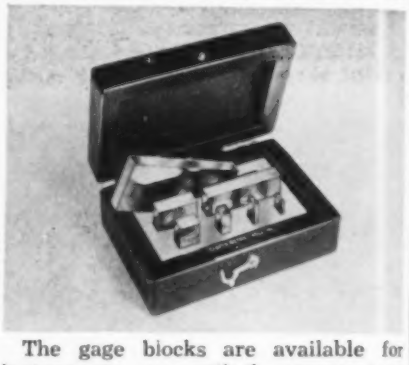
The double-end grinding spindle is motor driven and can be operated at a speed of 3450 or 6000 rpm. The motor is a 2 hp, 60 cycle, 440 V a-c.

Colonial-Romulus Div., Colonial Broach and Machine Co., Parkgrove Station, Detroit 5, Mich.

Use postpaid card. Circle No. 121

Gage Blocks for Measuring Instruments

A simplex seven-block set of gage blocks consists of 1 each block 1/16", 1/8", 1/4", 1/2", 1", 2" and 3" at nominal cost of $50.00 including hardwood case.



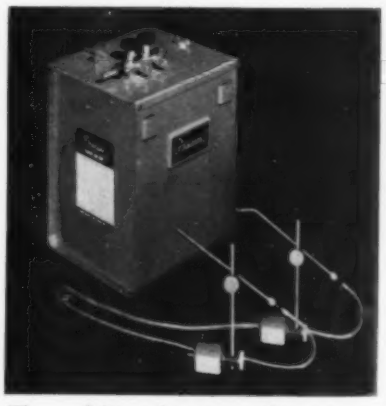
The gage blocks are available for instruments as optical comparators, toolmaker microscopes, coordinate measuring stages, as well as precision machines. Guaranteed accuracy is + .000006"—.000002".

Opto-Metric Tools, Inc., 137 Varick St., N.Y. 13, N.Y.

Use postpaid card. Circle No. 122

Refrigeration Adds Efficiency to Machining

The cooling method, called Vapor-Lub, reduces temperatures of the work area by refrigeration, and minimizes cutting tool heat with a special lubricating concentrate which is atomized under pressure and deposited on the tool and work surface.



The refrigerating operation, accomplished by the sudden expansion of compressed air through a precision nozzle, absorbs heat from the surrounding work area and reduces temperature of the cutting surface.

Precise Products Corp., Racine, Wis.

Use postpaid card. Circle No. 123

accent on Accuracy!

Whitnon HIGH FREQUENCY ELECTRIC **Spindles**

Modernize your present internal grinders and special milling machines with Whitnon High Frequency Electric Spindles

It's the accent on accuracy that gives this missile perfect performance at high speeds

It's the *accent* on *accuracy*, too, that builds perfect high-speed performance into Whitnon High Frequency Spindles. Whitnon Spindles deliver maximum — and vibrationless — horsepower to all grinding wheels and tools . . . at speeds from 10,000 to 120,000 RPM.

Spring pre-loaded and dynamically balanced after assembly, they assure you better control of finish and size — faster stock removal — and the high quality production that earns you higher profits.

IN STOCK TO FIT MOST GRINDERS
8 HP at 10,000 RPM to ¾ HP at 120,000 RPM

Available for:
- HEALDS
  - 3" Center Height
  - 3½" Center Height
  - 4" Center Height
- BRYANTS
- Special spindles for duplicating, wood and non-ferrous routing, synthetic textiles and spin testing.

WRITE FOR LITERATURE TODAY.

THE Whitnon MANUFACTURING COMPANY
ROUTE 6 AND NEW BRITAIN AVE, FARMINGTON, CONNECTICUT

Gear Tooth Chamfer Grinder

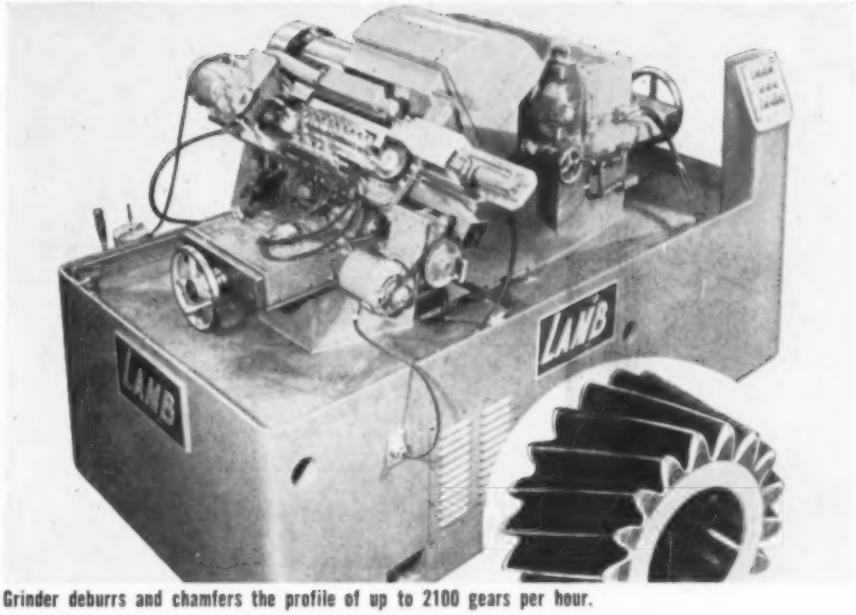
The method of parts handling and feeding accounts for the high production rate of the gear tooth chamfer grinder, limited only by the diameter of the gear. The machine is said to be capable of deburring and chamfering hardened gear teeth at the rate of 900 to 2100 gears per hour.

Machine operation is continuous and fully automatic. Work loading and ejection features are designed to be completely adaptable to automated parts handling systems, or loading can be performed manually.

Part dimension or gear tooth configuration changes can normally be accommodated with minor fixture revision and by changing the crush roll form dresser to suit new work.

F. Jos. Lamb Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.

Use postpaid card, Circle No. 124



Grinder deburrs and chamfers the profile of up to 2100 gears per hour.

Skin Protective Lotions

A corrosion-resistant ingredient which prevents spotting of highly finished metal surfaces by workers' perspiration or fingerprints is now a part of skin protective lotions. The anti-corrosion factor is dispersed in a water-soluble plastic film which is deposited on the skin by evaporation of Milburn's Ply No. 9 Liquid.

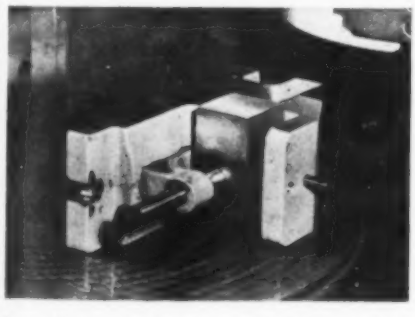
The plastic film is impervious to cutting oils and solvents, and to most common hazards met in machining and inspection of metal parts.

Milburn Co., 3246 E. Woodbridge, Detroit 7, Mich.

Use postpaid card, Circle No. 125

Small Parts Fixture

The Multi-Square, for holding small and medium pieces for precise squaring operations, can be used for grinding or milling all sides square on a block. The work is held to a precisely vertical leg by a clamp pivoted at the rear of the



leg—thus no distortion of the vertical position of the leg is possible.

The body is made from a normalized semi-steel casting, machined and ground on all working surfaces. The vertical clamping surface is a replaceable tool steel face. The clamp is a steel casting.

Applications to date include use as a milling and grinding fixture, drill jig, and layout and inspection fixture.

Manchester Machine and Tool Co., 5142 Manchester Rd., Akron 19, Ohio.

Use postpaid card, Circle No. 126

Here's an interesting Idea-Book for you!

NEW!

Sundstrand Magnetic Chuck Catalog for Grinders

Manufacturers and owners of grinding machines will both find many time-saving and profitable work holding ideas in this new 12-page book.

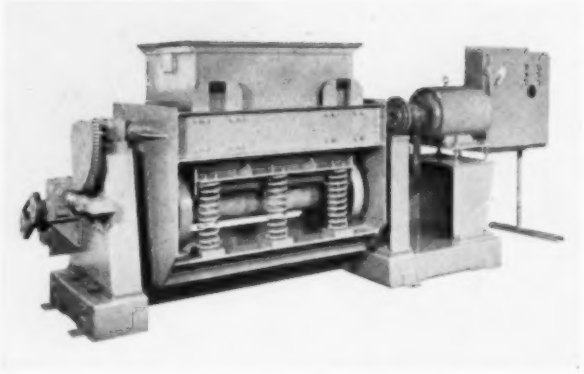
Simplification of set-ups, powerful holding of heavy work plus many other features are included. Write for your copy today. Ask for Bulletin 391-M.

SUNDSTRAND POWER-GRIP ®

SUNDSTRAND MACHINE TOOL CO.
Magnetic Products Division
2531 ELEVENTH ST., ROCKFORD, ILLINOIS

Controlled Vibrator Speeds Precision Finishing

The Lorco Vibrator has controlled vibration and permits a certain flexibility in vibrational frequencies and amplitudes. This equipment for the descaling, deburring, grinding, fine finishing, coloring and burnishing of all metals and alloys and many plastics is claimed to be extremely fast.



Not just a tumbling barrel with vibration added, every cubic inch of load in the new type machine is in continuous work motion, it is said, as against the usual slide of the tumbling barrel. In addition, there is also present an effective scrubbing action, which is caused by frequency and amplitude.

Stock removal up to 200 micro-inches was achieved on hard stainless-steel turbine blades in 30 minutes when such blades were suitably fixtured. While small parts can be vibrated free, heavy parts must be racked or fixtured. When parts are fixtured in the vibrator, the time cycle is said to be reduced 50%.

Models currently available range from 10 to 30 hp and in bowl capacity from 6.92 to 17.50 cu. ft.

Lord Chemical Corp., 2068 S. Queen St., York, Pa.

Use postpaid card. Circle No. 127

Bench-Type Abrasive-Belt and Disc Grinder

The Versa-Mite has a coated abrasive disc, fastened to the side of the contact wheel, and a tilting adjustable table which permits square and angle grinding as well as chamfering and surfacing. A bench-type machine, it incorporates a fast cutting abrasive belt, and a serrated contact wheel.

Abrasive belt extension arms can be mounted on both ends of the motor for roughing and finishing with one handling of the material.

Flat surfacing applications are done on the platen which is mounted on the extension arm.

Inside diameters or radius sanding or finishing is accomplished by using a coated abrasive sleeve on an expanding rubber drum.

Grinding wheels, wire brushes or buffing wheels can be mounted on either end of the motor. Grinding wheel guard and tool rest are furnished as optional equipment.

The machine retails for $192.50.

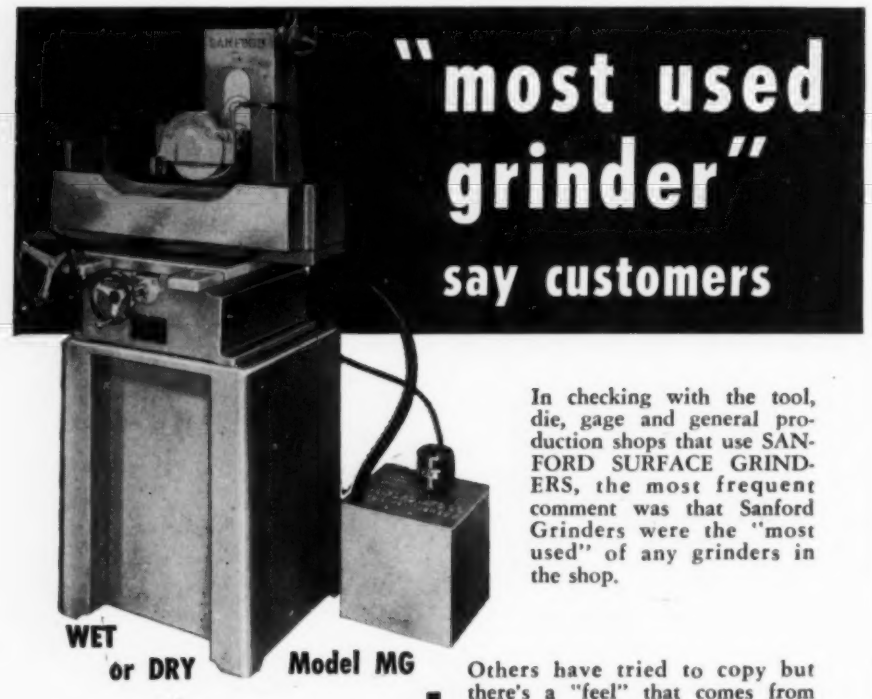
Curtis Machine Div., The Carborundum Co., Jamestown, N.J.

Use postpaid card. Circle No. 128

Dial Indicator Gauge Has Built-In Potentiometer

A heavy-duty dial indicator gauge, No. S-2037-2, with measuring range up to 4" reading in .001", features a built-in potentiometer. It can be used for visual and electrical indication of position or travel of slides, cam actions, etc.

The potentiometer provides an electric feedback signal for controlling auto-



In checking with the tool, die, gage and general production shops that use SANFORD SURFACE GRINDERS, the most frequent comment was that Sanford Grinders were the "most used" of any grinders in the shop.

Others have tried to copy but there's a "feel" that comes from the precise individual quality and workmanship that goes into every SANFORD GRINDER. It's the factor that can't be found in any other grinder.

So widely used you can ask users in your own area how they like the low priced Sanford Surface Grinder.

Write for illustrated and fully descriptive literature, reconditioning facilities, optional equipment and prices.

PARTIAL SPECIFICATIONS—

Capacity — 8" x 12" x 12".
Table travel — 13", traverse 8¾".
Vertical clearance 12" under 7" wheel.
Standard grinding wheel—7" x ½", 1¼" hole.
Spindle speed approx. 3000 RPM.
Motor, ½ HP, single or 3 ph., dynamically balanced.
Floor space—45" x 38" x 62" high.
Net wt. with stand approx. 630 lbs.

Representatives in major industrial areas

SANFORD MANUFACTURING CORP.
1026 Commerce Ave., Union, N. J.

Front and back views of dial indicator gauge.

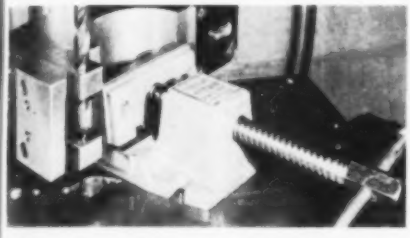
mated machines or equipment. Thus the operator, with both visual and electronic control, has a two-way check on tolerances.

B. C. Ames Co., Waltham, Mass.

Use postpaid card. Circle No. 129

Compact Drill Press Vise Has Giant Jaws

A drill press vise combines amazingly large jaw capacity with compact outside dimensions. The model shown holds a workpiece that is 4½" deep, 8½" long, and 2¾" high.



The vise features machined top, bottom, and sides, for accurate 90° hole drilling without a fixture, and Wilton's rapid Titan nut, which combines free sliding action with unlimited screw action, without use of moving parts.

The vise is available in three rapid action and three conventional action models, with jaw sizes of 3½", 4½" or 6".

Wilton Tool Mfg. Co., Inc., Schiller Park, Ill.

Use postpaid card. Circle No. 130

Compact 9" Precision Lapping Machine

The Spitfire flat lapping machine, ultracompact, semi-automatic, features a 9" close grained cast iron alloy lapping plate. The lapping surface is a precision ground unit, grooved both radially and spirally for maximum efficiency, and is specially heat treated to prevent distortion. Volume output to close tolerances of 11.6 millionths of an inch are readily obtainable.

A parts retainer work holder conditioning ring assures flat lapping surface by applying a truing action during lapping operation. For automatic operation, an automatic timer is also incorporated for control of lapping cycle.

Spitfire Tool and Machine Co., 2931 N. Pulaski Rd., Chicago 41, Ill.

Use postpaid card. Circle No. 131

Drill Grinder Has Storage Cabinet

The Worcester drill grinder now includes a complete new housing, and also a storage cabinet. Top of the cabinet forms a rubber-padded work tray.

A safety plexiglas eyeshield has been added for the operator's protection. The grinder also boasts a new built-in diamond dresser, work light, push-button switch, with overload protection, and a new tool rest for utility grinding. There is an optional extra of a mist coolant system.

Black Diamond Saw & Machine Works, 121 North Ave., Natick, Mass.

Use postpaid card. Circle No. 132

Prevent Toolroom Bottlenecks and Increase Production

with Hammond of KALAMAZOO

CARBIDE TOOL and CHIP BREAKER GRINDERS

SCE-6 Oscillating Electrolytic Carbide Tool Grinder. The wheel oscillates.

CBW-6 Chip Breaker and Diamond Finishing Grinder. Electrolytic Chip Breaker Grinder also available.

14-WD Wet or Dry 14" Carbide Tool Grinder. 6" and 10" models also available.

SAVE TIME · TOOLS · WHEELS

America's most modern and complete line of Carbide Tool, Chip Breaker and Diamond Finishing Grinders. Over 10,000 in service.

Ask for Carbide Grinder Catalog.

Hammond Machinery Builders INC.

1651 DOUGLAS AVE. · KALAMAZOO, MICH.

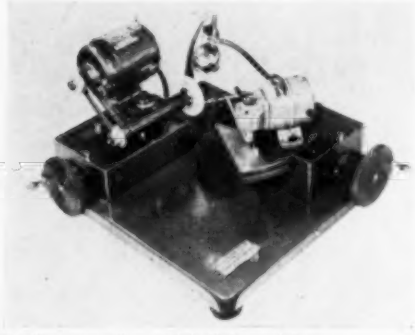
NEW EQUIPMENT *continued*

Diesel Nozzle-Valve Grinder

The Federal diesel nozzle-valve grinder, Model FMT No. 1, has nozzle driven in a V rest by means of a separate motor which is said to assure concentricity with cone. The grinding head is built to an exacting degree of accuracy. The grinder is used for reconditioning of nozzle assemblies for diesel engines.

Federal Machine Tool Co., Emmett St., Bristol, Conn.

Use postpaid card. Circle No. 133



Loading arm gives quick fixture pick-up.

Work Driver Features Angular Serrations of the Jaws

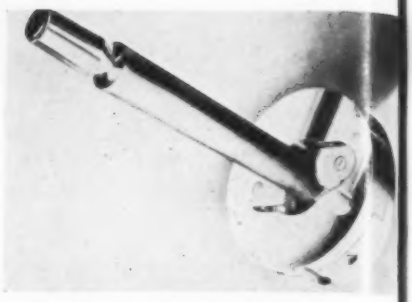
Designed to eliminate dogging time and increase productivity by permitting an operator to handle two or more machines is the Seneca Falls work driver. It is self-centering, quick acting, and positive.

Angular serrations of the jaws of the work driver provide overlapping contact and positive quick grip on both smooth finish and hot rolled stock, and on forgings having relatively hard surface.

Drivers are available in 18 sizes with work diameters from ¼" to 6⅞".

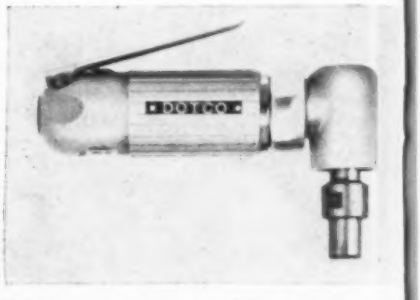
Seneca Falls Machine Co., 11 Fyfe Bldg., Seneca Falls, N.Y.

Use postpaid card. Circle No. 134



Pneumatic Tool Finishes Hard-To-Reach Areas

An angle-drive rotary-vane type pneumatic tool, known as Dotco Model 1AE, is especially suitable for contour finishing of dies, moulds, patterns, etc. Because of its angle-drive design, compactness and small size, the tool can be used for finishing hard-to-reach areas. It can be used with a flexible disc holder with contour sanding discs up to 4" in diameter, carbide burrs, or with mounted wheels of various sizes. An Erickson 300 series collet chuck is standard.



Doeden Tool Corp., Sherwood, Ohio.

Use postpaid card. Circle No. 135

Tough Grinding Wheel Forms Dressed Easy as A, B, C

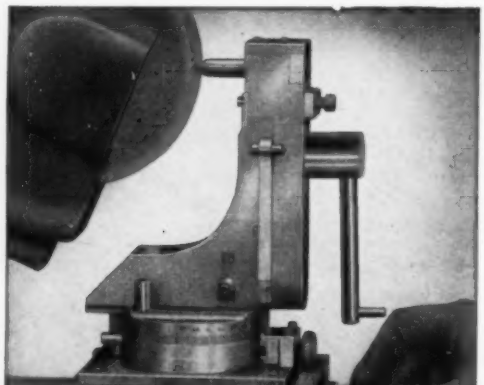
eliminate elaborate set-ups and operations

.0001" ACCURACY

Fluidmotion

WHEEL DRESSERS

dress two angles tangent to a radius in one continuous motion



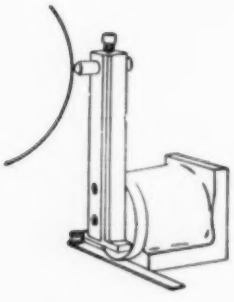
With the unique "Fluidmotion" Dresser, you can dress two angles tangent to a radius — using one handle in one continuous motion. Operation is so fast and simple that beginners can use them.

Adaptable to all type cylindrical and surface grinders.

A. Obtain micrometer reading; add required convex radius or subtract required concave radius.

B. Loosen jib with wrench and "mike" over lower pins to reading obtained above.

C. Tighten jib. Set stops for two angles. Ready for action.



Also available: "FORM MASTER" Dresser, capable of dressing any radii up to 12" convex, up to 15" concave.

See your industrial distributor or write for free literature.

J&S TOOL CO. INC. — SAW CLAMPS • PRECISION VISES • DOWN-HOLDING DEVICES — CLAMPCUT

J & S TOOL CO., INC.

850 DORSA AVE.
LIVINGSTON, NEW JERSEY

IMPROVED METHOD OF SILVER BRAZING the brass toolpost mounting seats to the pole pieces of the Tiny-Titan magnetic base tools is now being used. The new technique is said to insure permanent and rigid anchoring of the seat, making for great precision and control in setting up and reading indicators. Enco Mfg. Co., 4520 W. Fullerton Ave., Chicago, Ill.

Use postpaid card. Circle No. 136

Drum Sander

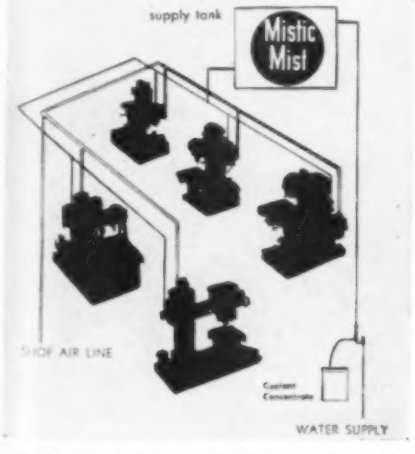
The Cone-Loc drum sander makes it possible to use ordinary strips of coated abrasive rather than endless belts, effecting savings in abrasive cost, according to the announcement. Through easy inter-change of a variety of coated abrasive in grits from coarse to fine, it is possible for the tool to be used for all stages of metal removal, grinding, and polishing.

American Diamond Saw Sales, 120 N.W. Ninth Ave., Portland 9, Ore.

Use postpaid card. Circle No. 137

Centralized Coolant Systems

Mistic Mist centralized cooling systems supply pre-mixed coolant to any number of machines from a single supply source using the principle of gravity feed. The injector valve on the water supply permits supply tank refill from floor level. The ratio of the mixture is governed by the size of the supply tank and the amount of concentrate dilution.



Individual control valves are mounted on each machine convenient to the operator for immediate and precise control of air and coolant mixture.

Aetna Mfg. Co., Bensenville, Ill.

Use postpaid card. Circle No. 138

Machine Combines Grinding and Lapping

The Speedlap Model 32 lap grinding machine, combining grinding and lapping, is said to be practical for any flat or surface ground part for degrees of finish from 32 to 1 rms, and flatness from .010 to 2 millionths.

By lap-grinding, which uses loose grit, intermediate jobs of rough grinding or even milling operations are eliminated. Parts are ready for the machine as cast, sintered, stamped or turned. It handles tough carbides and steels as well as ceramic and plastics.

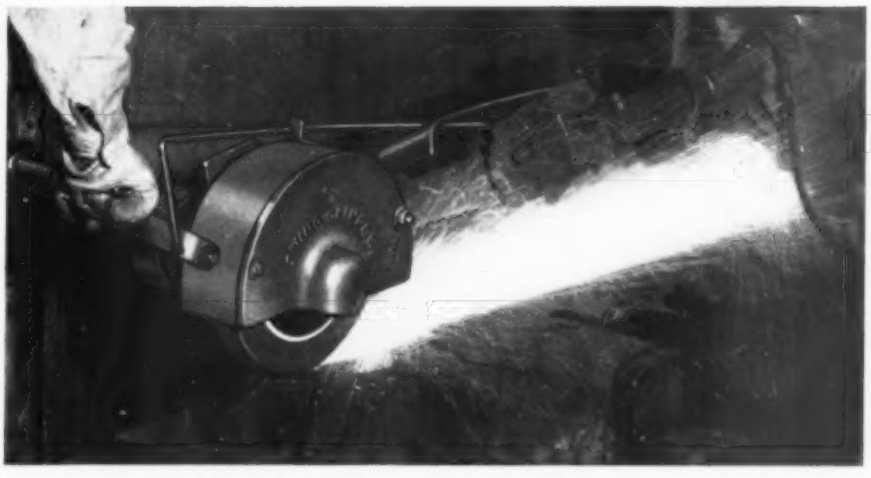
A special steel alloy plate is used with a new abrasive media. An inbuilt system sizes all parts easily without distortion, heat cracks, or burrs.

Abrading Systems Co., 8020 Monticello, Skokie, Ill.

Use postpaid card. Circle No. 139

ATLANTIC WHEELS

spark new savings on snagging operations!



Take the toughest snagging operation you can find, add fast-cutting, cool-running Atlantic Grinding Wheels, and watch your grinding costs flatten out to a money-saving minimum. Made with a special resinoid bond to withstand high centrifugal forces, these work-proved wheels have a smooth, floating action that speeds up grinding . . . gives you cleaner surfaces with fewer passes.

Start saving now, by giving Atlantic Grinding Wheels a trial run in your plant. An Atlantic representative will gladly recommend the right wheel for your particular operation without obligation. Write for details and a copy of the **Atlantic Grinding Wheel Catalog.** Atlantic Abrasive Corporation, 532 Pearl Street, South Braintree 85, Massachusetts.

Atlantic Abrasive Corp.

A DIVISION OF ABRASIVE PRODUCTS, INC.

South Braintree 85, Massachusetts

STRAIGHT WHEELS • CYLINDER WHEELS • CUP WHEELS

CONES • PLUGS • MOUNTED WHEELS AND POINTS

...wherever abrasive operations are performed

Abrasive Society News

AMERICAN SOCIETY FOR ABRASIVES representatives' meeting held on January 20, 1958, in New York. Standing from left to right: R. H. Powers, American Optical Co.; L. S. Hilton, Manhattan Rubber Division; J. Arnst, Macklin Co.; A. S. Wyborski, Peninsular Grinding Wheel Sales Corp.; K. S. Cowlin, Electro Refractories & Abrasives Corp.; William F. Schleicher, "Grinding & Finishing" magazine; Frank Barth, Richard & Gunther Advertising Agency; John Howlett, Morrison Products Inc.; and C. E. Tate, field representative of A.S.A. Seated from left to right: James D. Earley, The Fuller Merriam Co.; Ted O'Connell, Macklin Co., national chairman of A.S.A.; R. B. Ryder, General Electric, vice-president of A.S.A.; John Y. Arnold, Carpenter Steel, president of A.S.A.; Frank H. Palmers, Simonds Abrasive Co.; J. G. Bair, Fox Grinders Inc., director of A.S.A.; L. C. Seelye, Bay State Abrasive Co.; Robert G. VanKeuren, Norton Co., and Dirck Olton, Behr-Manning.

April 4, 1958

Dear Mr. Schleicher:

Up to the present time we have received a total of 23 responses from you to the notice concerning the Society which was published in the March issue of **Grinding and Finishing.**

I am simply writing to you again to express the Society's appreciation for what you have done in this respect.

Very truly yours,
Jan L. Deelman
Secretary, General Counsel

Boston Chapter

The monthly meeting of the Boston Chapter was held on January 28 at M.I.T. Graduate House, Cambridge, Mass., with 40 members and guests present.

J. C. Arndt of Simonds Abrasive Co. spoke on grinding wheels and their application, and showed a film entitled "Making an Abrasive Wheel." Question and answer period followed the film.

The next meeting was scheduled for March 25 at the M.I.T. Graduate House.

The March meeting was held March 25 in the M.I.T. Graduate House, Cambridge, Mass. Members and guests present totalled 37.

A color and sound film entitled "Grinding Wheel Safety" was shown by Gilbert Balke of the Norton Co., Worcester, Mass.

The nominating committee presented nominations for officers for the coming year, to be voted on at the May 27 meeting.

The secretary is **I. C. Day** of Cutter, Wood & Sanderson Co., 222 Third St., E. Cambridge, Mass.

Detroit Chapter

The Detroit Chapter met January 30, 1958 at 24100 Woodword Ave., Pleasant Ridge, Mich. A business meeting was held with Thomas Thornton becoming a new member of the Board of Governors.

Thomas W. Buirley of International Research and Development Corp. followed the business meeting with a program consisting of a demonstration of the vibration unit for detecting vibration sources and balancing grinding wheels.

The March meeting was held on the 27th at Pleasant Ridge, Michigan. President Cal Edwards gave a report on several items of interest to the members. Ray Columbo, program chairman, reported on a line-up of future meetings. Dennis Hurley reported that the April 24 meeting was to be held at Ford Motor Company's Central Office Building, and the May get-together would be a dinner meeting at Carson's Supper Club.

After the business meeting, E. V. Flanders of Jones & Lamson Machine Tool Co. and James Longwell of Koebel Diamond Tool Co. presented their program on perpetual grinding wheel form control.

The secretary is **Eugene Kiezel,** Denham & Company, 925 Book Bldg., Detroit, Michigan.

Pittsburgh Chapter

The January 16 meeting of the Pittsburgh Chapter was held in Pittsburgh with 66 members and three guests present.

A representative from Mattison Machine Co. explained grinding machines through a talk and silent film.

The next meeting was scheduled to be held at Royal York on March 20.

New Jersey Chapter

A monthly meeting was held on March 19 at the Blue Shutter Inn, in Union, New Jersey, with 57 members and guests present.

Robert C. Fisher, Manager of Abrasive Sales Engineering Div., Cincinnati Milling Machine Co., spoke on "In and Outside the Grinding Wheel," after the business meeting.

The April meeting was scheduled for April 16, with the topic to be "Crush Grinding," presented by the Sheffield Corp. of Dayton, Ohio.

Society News . . .

A social event was to be held on May 24, with details discussed at the April meeting.

The secretary is **Joseph A. Roman**, 1 Emery St., Iselin, N.J.

Western Michigan Chapter

Seventy-four members and guests were present at Bill Stern's Steak House in Muskegon on March 17.

The discussion of the evening was on centerless grinding. W. H. Baum of Cincinnati Milling & Grinding Machines, Inc., gave a talk which was followed by a panel discussion on the subject.

The roster of officers elected at the business meeting were: **Ralph Ploughman**, Chairman; **Charles Hennesen**, Vice-Chairman; **Paul Starks**, Secretary-Treasurer; **Sidney Tornga, William McCormick**, and **Paul Watson**, Trustees.

Electrolytic Carbide Grinding is the subject for the May meeting to be held at Grand Rapids.

The secretary is **Charles J. Hennesen**, 2171 Monte Ave., Muskegon, Michigan.

★ ★ ★

A meeting of the representatives of associate members of American Society for Abrasives was held January 20, 1958, at 10:30 A.M. in the Town Room of Hotel Statler, New York City, with 19 representatives, officers, and directors of the Society and guests present.

The national chairman, T. J. O'Connell, welcomed those present and introduced the president, John Y. Arnold. The president stated that it had been thought best to conduct the meeting on a thoroughly informal basis, somewhat along the lines of a "brainstorming" session, so that ideas and suggestions might be more readily set forth and discussed.

John N. Howlett, of Morrison Products, Inc., expressed interest in aiding the formation of a chapter in Cleveland.

Frank Barth, of Richard and Gunther, New York, public relations consultants, expressed his views on ways in which the Society could grow. He asked how the Society could become financially more stable, and how it could be one of greater benefit to its members, and answered with several suggestions: (a) expand geographically to demonstrate the importance of the Society; (b) sponsor scholarships; (c) publication of a newsletter to be circulated to the members, and (d) holding of expositions.

Raymond B. Ryder felt that it should be a concern of the Society now to get technical papers published and circulated. One topic he suggested was high-speed grinding, a matter of great interest to many in the abrasives field.

A. S. Wyborski, Peninsular, felt that the Society during the coming year should concentrate some effort upon getting users to join as associate members. He felt that a field wherein the Society could be of use was in the development of standards. K. S. Cowlin, Electro-Refractories, shared this opinion and added the suggestion that the Society might develop a training course for foremen.

Ryder observed that there is a place in the Society for everyone interested in abrasives, no matter how large or small the company or what form of abrasive it is concerned with.

The meeting recessed for one hour for lunch at 12:30.

Dirck Olton, Behr-Manning, suggested that each Chapter form a committee to interview users of abrasives to discover ways in which the Society can help them.

James G. Bair, Fox Grinders, remarked that a major problem in the field is flange trouble, and that a study of standardization in this field would be well worthwhile.

There was a suggestion that the Society employ an engineer to study the problems of safety from all points of view, making a point of going into plants and studying the physical facts, with the permission of the companies.

With all present agreeing to help carry out the ideas voiced, the meeting adjourned at 3:30 P.M.

Jan L. Deelman, Secretary

• • •

REPRINTS AVAILABLE

Tooling for Stainless on Automatics
by W. E. McFee

Can Powdered Metallurgy Save You Time and Money?
by Samuel Bradbury, III, and George Karian

Controls and Advanced Mechanization
by Ralph E. Cross

Grinding and Finishing in Chrysler's TorqueFlite Transmission Plant
by Jack Kenyon

Organizing and Operating a Precision Barrel Finishing Department
by Morris S. Shipley and William A. Biebel

Case Histories Calculate the "Dollar Wisdom" of Using Portable Air Tools

Fixture Barrel Saves $124,000 on Finishing Costs

Centerless Grinding
by G & F Editorial Staff ..... **.35**

Developing Standard Time Data for Grinding Operations
by E. A. Cyrol **1.00**

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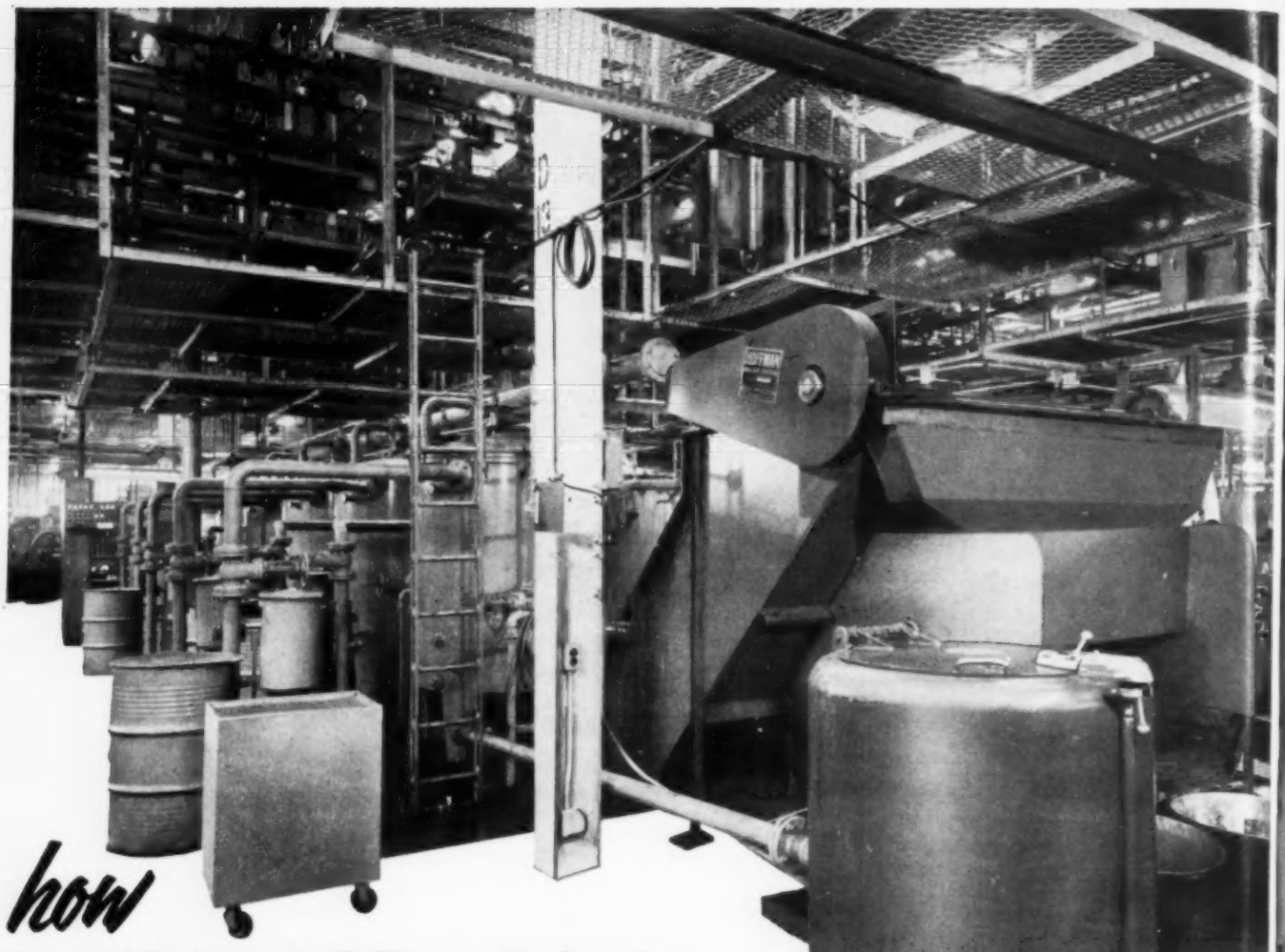


how

the world's largest oil filter central system saves more than $150,000 annually for a leading manufacturer...

Until U.S. Hoffman designed and installed the world's largest central filtration system in the plant of a leading automobile parts manufacturer, inadequate filtration of high viscosity grinding oils caused numerous costly production problems.

After one year of operation with the Hoffman central filtration system, costs were greatly reduced compared to previous methods. The total savings more than paid for the equipment and installation through these advantages:

- **43.4% saving in grinding wheels and diamonds.**
- **21.6% saving in system and actual production labor.**
- **32.5% savings in scrap (resulting from improved production).**
- **40% increase in production quality resulting from reduced downtime for wheel grinding change dressings.**
- **Equipment paid for itself in a little over six months.**

In projecting a new plant employing a second Hoffman central filtration system, the manufacturer estimated that 3 additional grinders could be eliminated with a saving far greater than the original cost of the equipment.

For comparable savings in your plant, why not have Hoffman engineers analyze *your* filtration requirements, without obligation or cost.

Write for an analysis, or free Bulletin FB 100.

custom designed **H** *for your needs*

INDUSTRIAL FILTRATION DIVISION

U.S. HOFFMAN MACHINERY CORP.

103 FOURTH AVENUE, NEW YORK 3, N. Y.

Machine Tool Coolant Clarifiers

Oil Conditioners

Solvent Recovery Systems

News of Industry

THE READY TOOL COMPANY has moved from Bridgeport, Conn. to its new home at 150 Garfield Ave., Stratford, Conn. Modern administrative and manufacturing facilities have been designed and constructed for production of precision tools. The new plant has ample room for expansion, parking, shipping, and employee recreational facilities.

AFS Show to Dramatize Man's Need for Metal; Film Theaters Provided

Man depends on metal 24 hours a day. His office machines . . . home appliances . . . television set . . . the very bed in which he sleeps at night . . . all required tons of castings in forming, processing, and bringing them to market.

The hundreds of exhibits in the coming AFS Castings Congress and Foundry Show—Cleveland Auditorium, Cleveland, Ohio, May 19-23—will demonstrate the latest machine and newest techniques for meeting the basic industrial demands of design and materials engineers in their use of metals.

Sand, the industry's most basic material, will form the basis for more exhibits than ever before. Exhibits relating to sand handling, conditioning, and usage will range from machines to materials and supplies, binders to coatings. These diversified exhibits will enable visitors to not only see but to compare the offerings for their own production requirements.

Because of exhibitors' demand for projection equipment from the Society, headquarters in Des Plaines, Ill., it was decided to provide two "little theaters" within the Exhibit Hall where interested exhibitors could run their product application films away from usual exhibit activities.

"This year, when more than the average number of companies indicated intentions of presenting films, we offered this new service which provides maximum opportunities to get the most out of both the booth space and the films as well. With over 60% of our exhibitors intending to stage operating exhibits and 56 hours of film projection, there will be a lot of action for the 15,000 foundrymen who will be in Cleveland for the 1958 meeting," stated W. W. Maloney, AFS General Manager.

Before Research Begins—Research for Profits

The Electro Refractories and Abrasives Corp., Buffalo, N.Y., is making use of a special product research committee which now screens ideas. The assignment is to come up with those projects which promise the most profits to the company.

The committee is comprised of executives from manufacturing, sales, engineering, and finance, and is headed by Research Director, George J. Easter.

The committee meets once a month, and discussions revolve around one subject a meeting. As part of its own research, the committee may call in other people from the company when their know-how is concerned. This includes inviting field men from any part of the country.

Sturtevant Announces Successful Particle Pulverizing

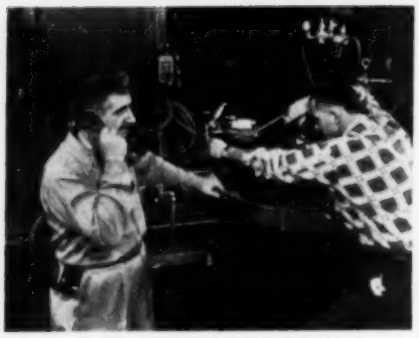
Sturtevant Mill Co., Boston, Mass., announces the successful fine grinding of particles to a half-micron (1/100th the diameter of average human hair) in modified Sturtevant micronizers, fluid energy mills with no moving parts.

Sturtevant's new board chairman, William T. Doyle, called the achievement "extremely important. Behavior efficiency in dispersions and blends can be made considerably more effective through micron-size particles. New materials constantly are being tested and work is in progress to adapt the micronizer to handle extremely hard and abrasive materials."

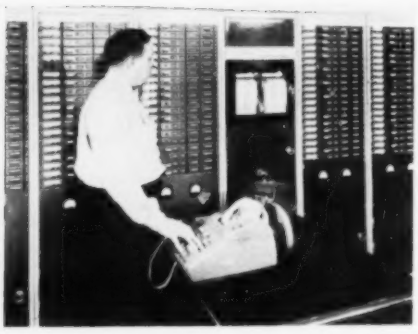
The micronizers operate on the principle of super-speed rotation of particles produced by jets of compressed air or steam, which causes violent impact of the particles and results in fine pulverization without attritional heat.

Eight sizes of micronizers are manufactured. The two smallest are 2" and 4" in dia.; the largest model, 36" in dia., offers a capacity of from 500 lbs. to more than two tons per hour.

A 35-POUND CARBIDE DIE INSERT, specially formed by General Electric's Metallurgical Products Dept., Detroit, is for a 280-pound draw die to form an automotive part. Using a profiler to put the finishing touches on the insert is a skilled worker at Bronson & Bratton Inc., Chicago.



The foreman arrives within seconds at the machine after being summoned by the dispatcher over the public address system. When he has analyzed the trouble, he confers with the dispatch room regarding action. The foreman carries a special telephone handset on his belt, which he plugs into the control box to converse.



The dispatcher can clear all the control cabinets in the dispatch room in as little as 15 minutes at the end of a shift. He uses a five-channel tape add-punch machine to read off information from the individual display panel registers. Once information has been read-off, registers are nulled and the equipment is set up for the next shift.

Production Control System Provides Management Tool to Lower Costs

Lower manufacturing costs and greater productive efficiency result from a new system announced today by Control Systems Company, Jackson, Michigan. The new system displays instantly in a central dispatch room what is happening at every machine in the production shop. A long-needed tool for manufacturing industries, the new equipment links every piece of productive machinery by means of electrical wires to a central production monitor room. In the monitor room, up-to-the-minute production data is provided in visual form for production control personnel. The system eliminates the need for time-consuming paperwork at all production supervisory levels.

Wherever parts are mass-produced, the new electromechanical system, named the Hancock Telecontrol, can monitor and control the entire production process, stage by stage, throughout each shift. It tells management at a glance how much is being produced, where, and what it costs. At the same time, in easily visible form, supervisors may tell what emergencies occur in the plant and require immediate attention, while the system routinely records incoming production data on registers for later use.

Carborundum Takes On Electronic Data Processing

Greatly improved customer service is high on the list of important benefits being derived from the Remington Rand Univac Data Processing System which was placed in operation last year by The Carborundum Company. The old order processing system had lacked the flexibility needed, and a sense of urgency was created by increasing volume of sales swamping both machines and personnel.

The domestic sales offices, warehouses, and plant locations are now linked by teletype with a computer center in Niagara Falls. Detailed cost studies and financial analyses, not economically available by manual means, will be turned over to the Univac system for fast computation. All paperwork, from customer order straight through to financial reporting, eventually was expected to be completely automated.

Micro-Precision's Diesel Operations Sold

All the machinery, inventories, and patents relating to the diesel operations of Micromatic Hone Corporation's Micro-Precision Division in Evanston, Illinois, have been sold to the Allis-Chalmers Mfg. Co., Milwaukee, Wis.

"The aircraft interests of Micro-Precision are not affected by the sale," said Don S. Conner, Micromatic president. "This phase of the activity, including the manufacture of the new Fabroid Teflon material, is being transferred to Micromatic's Los Angeles division."

BREAK THE "PROFIT SQUEEZE" WITH BRIGHTBOY

Improve Your Product at Lower Cost

The unique working action of multi-use Brightboy (*abrasive and rubber functioning simultaneously*) produces a finish that frequently constitutes the final polish.

Brightboy is a STOCK line, made in a wide range of Silicon Carbide and Aluminum Oxide grains. Each in grades from extra fine to extra coarse, in soft, firm and tough rubber binders. The compound is in the rubber. *No muss! No fuss!*

Brightboy numbers are JOB-MATCHED to your finishing requirements; often take the place of "special" compounds; prove their versatility on regular and special finishing.

A Brightboy finish frequently constitutes the final polish, without necessitating an extra operation.

Made in WHEELS, STICKS, RODS & BLOCKS for machine and manual applications. Ask your dealer to recommend the Brightboy numbers for your needs, and for the Brightboy catalog listing applications and machine speeds. Write for "Notes From The Brightboy Service Engineer," describing Brightboy applications and uses.

Write for FREE SAMPLE BRIGHTBOY HAND PIECE for quick-job cleaning

There Are Many NEW APPLICATIONS Never Before Associated With Finishing FOR TODAY'S RUBBER-CUSHIONED ABRASIVES! Replacing Costlier, Slower Methods

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
95 North 13th Street • Newark 7, N.J.
America's Pioneer Manufacturer of Rubber-Bonded Abrasives

WELDON ROBERTS Brightboy RUBBER CUSHIONED ABRASIVES

Removing Unbalanced Grinding Wheels Would Save Money

"Grinding wheel users can save themselves from 30% to 35% in diamond dressing costs by making sure their grinding wheels are properly balanced." This claim was made by Thomas W. Buirley of the International Research and Development Corp., Columbus, Ohio, before the Detroit Chapter, American Society for Abrasives.

Isolating these vibration sources as well as pinpointing areas of imbalance of grinding wheels are frequently headaches and money losses to users, Buirley said.

As an alternative, Buirley demonstrated an IRD vibration analyzer, an electronic unit, which isolates the vibration source and measures its frequency and amplitude. A strobe light hook-up focused on the rotating grinding wheel pinpoints the area of unbalance. Then correction is made by applying proper counter-weights.

Sundstrand Purchases Arter Grinding

Purchase of the Arter Grinding Machine Co., Worcester, Mass., by Sundstrand Machine Tool Co., Rockford, Ill., was approved by the Sundstrand Board of Directors during their March 25 meeting.

Involved in the purchase are Arter's name, inventory, patterns, fixtures, and patents. The building and the land are not included. Of special significance in the purchase is Arter's tape-controlled positioning table. The 44-year-old New England company also manufactures cylindrical grinders, rotary surface grinders, and special machine tools.

Arter assets will be integrated into the capital goods division of Sundstrand under Vice-President Burnell A. Gustafson.

Sundstrand now operates four major divisions—aviation, hydraulic, machine tool, and the new Sundstrand Turbo division organized following the acquisition of the Turbo Division of American Machine & Foundry Co. in January.

Norton Company Builds in So. America

Norton Co. of Worcester, Mass., and Carbometal, S.A. of Mendoza, Argentina, have formed a new company to produce silicon carbide for the Argentine market.

Called Norton Casali, S.A., the company will build a $500,000 electric furnace plant on a ten-acre site in Mendoza.

The Casalbi Company, Jackson, Mich., has named **E. S. Browning** as distributor for the California area. The Browning Company's main office is at San Francisco, with an office also at Los Angeles. They will handle the complete Globe line of Casalbi's barrel finishing equipment and supplies. The Browning Company has sold chemicals to various metal finishing users for 27 years.

IMPROVED LIGHTING SYSTEM, making use of the new General Electric Power-Groove fluorescent lamps, helps beat the high cost of doing business at the Erickson Tool Co., Solon, Ohio. The firm lights its 20,000 sq. ft. area with 230 Power-Groove fixtures, each containing two lamps. After six months, the company reports a 10% production increase, a reduction of 10% to 20% in grinding operation rejects, complete elimination of errors due to misreading of micrometers, and a 50% decrease in minor accidents. (Report from General Electric, Nela Park, Cleveland 12, Ohio.)

RIBON UNIVERSAL GRINDERS

Electro mechanical and hydraulic models produced by one of Europe's largest grinder manufacturers—completely universal with swinging internal grinding heads. 14" x 2" x 5" O.D. wheel with 3 H.P. and 18000 and 35000 I.D. spindles with 1½ H.P. Long conical adjustable plain bearings in both wheelhead and workhead with automatic pressure oil bath lubrication. All machines have automatic table traverse and infeeds.

11" x 20" Electro Mechanical Grinder $3600.00
11" x 32" Electro Mechanical Grinder $3775.00
11" x 42" Electro Mechanical Grinder $3930.00
Automatic Cycling Plunge Cut ...$650.00 addtional

All Prices FOB N.Y. or Chicago

LOW COST GRINDERS

Write for Catalog

CENTRI CENTERLESS GRINDERS

Close tolerance production units capable of .0001" tolerances in production. Long conical adjustable plain bearings on both grinding wheel and feed wheel spindles with pressure oil bath lubrication. Equipped for bar feed, thru feed, and infeed work with automatic ejectors and automatic cycling on infeed where desired. Diamond or crush dressing on both wheels with contour form and taper dressing of wheels by either hand feed screw or hydraulically.

Model 0—Work Dia. .020"-½". 10 x 2½" x 5" Wheel with 3 H.P. $2250.00
Model 1—Work Dia. .020"-2". 12 x 4 x 5" Wheel with 5 or 7½ H.P. $3450.00
Model 3—Work Dia. .030"-3". 14 x 7 x 8" Wheel with 16 H.P. $5750.00

All Prices FOB N.Y. or Chicago

THE AMERICAN HERFORDER CORP.
1801 W. COLUMBIA AVE. CHICAGO, ILLINOIS

Elgin Abrasives Division Names Five Distributors

The Abrasives Division of Elgin National Watch Company announces the appointment of five new stocking distributors handling the company's line of Golden Circle solid carbide tools.

The new organizations and areas are: **A.B.C. Sales Co.**, Union, N.J. (Northern New Jersey); **Medio Co.**, N.Y., N.Y. (Manhattan and Bronx); **See-Lect Industrial Equipment Co.**, North White Plains, N.Y. (Upper Metropolitan New York State); **Southern Tool Distributing Co.**, Atlanta, Ga. (Georgia), and **Monnier Tool & Supply Co.**, Dayton, Ohio (Dayton area).

Two manufacturing divisions of ACCO, the Allison Division and the Campbell Machine Division, have joined forces to provide an authoritative headquarters for the solving of abrasive cutting problems. The new name will be **Allison-Campbell Division, American Chain & Cable Co., Inc.**, Bridgeport 2, Conn.

The Campbell Division manufactures abrasive cutting machines and nibbling machines, and the Allison Division manufactures rubber and resinoid bonded abrasive cutting wheels.

Electro-Autosizing Machine Corp. has announced their new, modern factory building and facilities at 7 William St., Closter, N.J., have been completed, and they are now more fully equipped to serve the metalworking industry in their precision gauging and automatic needs.

Strong, Carlisle & Hammond, Cleveland, Ohio, has been appointed crucibles and furnace refractories distributor for **Electro Refractories & Abrasives Corp.**, Buffalo, N.Y. The Cleveland supply house will be responsible for marketing areas within a 125-mile radius.

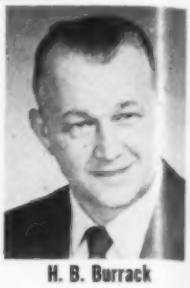
Electro has also named the **W. E. Mushett Co.**, San Francisco, as distributors of grinding wheels in the San Francisco Bay area.

Further expansion of its sales and service organization for air and hydraulic cylinders has been made by Hydro-Line Mfg. Co., Rockford, Ill., with the appointment of sales engineering representatives. **H. R. Taylor & Co.**, Indianapolis 20, Ind., will represent them throughout the state of Indiana, except the city of Gary. **Ranney Engineering**, Chicago, will cover Chicago, Gary, and Northeastern Illinois.

Grinding wheels for foundry use, melting crucibles, refractories and furnace cements will be exhibited by **Electro Refractories & Abrasives Corp.**, Buffalo, N.Y., at the 62nd Castings Congress and Foundry Show, May 19-23, at the Cleveland Auditorium, Cleveland, Ohio.

Completion of new plant and laboratory facilities in Detroit has been accomplished by **E. F. Houghton & Co.** The Detroit Sales Division is headed by Sales Manager Harry E. Martin.

G. W. Loveday



H. B. Burrack

G. William Loveday has been advanced to the position of assistant manager of Industrial Component Sales of the Flexible Tubing Corp., He joined the firm's Sales Engineering Dept. in September, 1956, having previously been with the Dravo Corp. and Pratt & Whitney Div., United Aircraft Corp.

Harry B. Burrack has been appointed technical superintendent of the Olin Aluminum division rolling mill of Olin Mathieson Chemical Corp. The mill is located between Clarington and Hannibal, Ohio. Burrack will supervise quality control, metallurgy, chemistry, and testing.

Bay State Abrasive Products Co. of Westboro, Mass. recently appointed seven men to augment their nationwide sales force. They are:

MICRO ABRASIVES CORP. WESTFIELD, MASS.

Specialists in Fine Abrasives

ABRASIVE POWDERS for METAL, GLASS, STONE and PLASTICS POLISHING and for FRICTION POWDERS

If your NEEDS are LARGE or SMALL

We offer a TRUE CUSTOM SERVICE in the MANUFACTURE of FINE and ULTRA-FINE ABRASIVE POWDERS

Now in manufacture, fused and unfused Aluminum Oxides—and more to come.

YOUR PROBLEMS ARE OUR BUSINESS

"SERVICE" is our slogan! CALL ON US!

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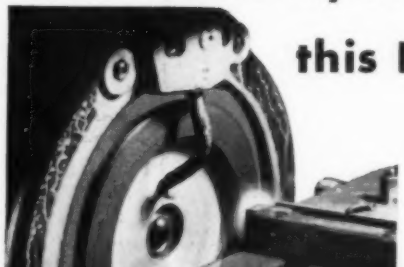
NOW...Better by actual test...



this NEW A.I.T. "E-2" Diamond Wheel for...

ELECTROLYTIC GRINDING

The exclusive "E-2" bond in A.I.T. diamond wheels has been developed specifically to guarantee that you get the FULL VALUE out of Electrolytic grinding of carbides. We can prove this in YOUR plant, on YOUR grinders, with these results:

1. **Wheel pre-run to eliminate break-in time in YOUR plant.**
2. **Faster stock removal.**
3. **High peak removal for longer intervals**
4. **Longer wheel life.**
5. **Less corrosive action**
6. **Specially designed wheel to reduce weight and distribute electrolyte efficiently**

Remember, to get these FULL VALUE results, be sure to send for complete test data today.

A.I.T. Diamond Tool Co.

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SKOKIE, ILLINOIS

M. A. Winter

R. H. Floodstrand

J. E. Allen

D. M. Vlaun, Jr.

G. A. Curylo

A. D. John

J. G. Berg

J. C. Danec

M. A. Winter, territory of Ark., Okla., and the Texas Panhandle; **Robert H. Floodstrand**, field engineer in the Chicago area; **John E. Allen**, Chicago area sales force; **Daniel M. Vlaun, Jr.**, Metropolitan New York City area; **Gerald A. Curylo**, territory of Conn.; **Arnold D. John**, Philadelphia area, and **John G. Berg**, salesman in the New England area.

Joseph C. Danec has been appointed supervisor of sales of abrasive products for the masonry and concrete trades by Norton Co. He was formerly technical assistant to the production engineer of Norton Behr-Manning Overseas Inc.

L. S. Hilton has been appointed sales manager of Abrasive and Diamond Wheel Departments of The Manhattan Rubber Div. of Raybestos-Manhattan, Inc., Passaic, N.J. He succeeds **W. H. Steinberg**, who is now technical consultant.

Appointment of **Robert J. Dilger** as purchasing director for Tube Turns, Louisville, Ky., a division of National Cylinder Gas Co., Chicago, was announced by John G. Seiler, division president.

Dilger has been in charge of purchasing for The Girdler Co. and Tube Turns for the past sixteen years.

Election of **K. B. Wolfe** and **Art Linkletter** to the board of directors of Cohu Electronics, Inc., San Diego, Calif., was announced by the president, La Motte T. Cohu. Cohu Electronics manufactures instruments for communications, measurement, and control.

Wolfe, executive vice-president and a director of the Garrett Corp., also is president of the Oerlikon Tool & Arms Corp. Linkletter, nationally known radio-television star, is president of Touch-Plate Corp., a vice-president of Royaltone, and a partner in John Guedel Productions.

Harold E. Erf has been appointed Chicago District Sales Manager for Sterling Grinding Wheel Co., Tiffin, Ohio. He was formerly manager of Sales Administration for the same company.

George H. Dennison has been named general manager in charge of sales at Keystone Abrasive Wheel Co. of Carnegie, Pa. Previously he was a district sales manager for the Carborundum Co. of Niagara Falls, N.Y.

Karl A. Wildason is the new sales manager of Hohman Plating & Mfg., Inc., Dayton, Ohio. He will direct sales activities of Hohman's Surf Kote solid film lubricants and their production metal finishing service. Before affiliating with the company, he was cofounder and operator of the Dayton Re-New Tool Co.

The Northeast sales district of Raybestos-Manhattan now has **Stewart Monroe** as special representative of National Accounts. **John McKinlay** replaces him as Northeast district manager.

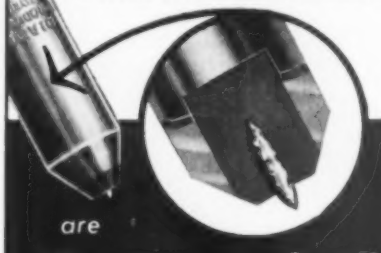
Do you use short cuts in your work? Do you have any kinks which would be helpful to the next fellow? Send them to GRINDING and FINISHING for publication. All material is paid for! Material can be in your own words, drawings can be rough pencil sketches; our editorial and art departments will do the rest. Send your Hints and Kinks to: Editor, GRINDING and FINISHING, 222 E. Willow Ave., Wheaton, Ill.

Only

PRESTALLOY®

Oriented

DIAMOND DRESSERS



are

"Pressure-Set"

to

LAST LONGER...

CUT CLEANER

Regardless of your wheel dressing problem . . . you'll find PRESTALLOY tools cut cleaner and last longer . . . thanks to exclusive "Pressure-Set" processing! This advanced method of anchoring, permanently locks the diamonds in place at the correct operating angle . . . to insure maximum dressing speed and efficiency. Couple these field-proven advantages with the completeness of the PRESTALLOY line, and you'll know why there's a PRESTALLOY tool to meet your specific needs. Below are shown but a few of the many standard PRESTALLOY dressers immediately available.

SINGLE STONE DRESSERS for straight form and radius work.

IMPREGNATED DRESSERS for production grinding operations.

MULTI-DIAMOND for straight face and side dressing.

PROFILE DRESSERS for straight, form and profile use.

New illustrated PRESTALLOY catalog yours for the asking. Write today!

Fast delivery on non-standard dressing tools to your exact specifications. Send us your prints for quotation.

DIAMOND PRODUCTS, INC.

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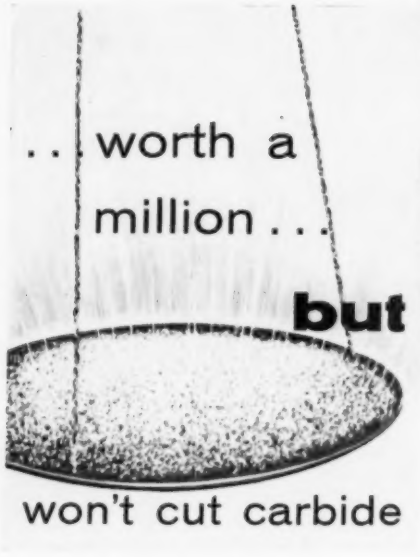
Dealerships available in some areas



PROPER BOND IS NECESSARY

To reduce carbide cutting costs to a minimum, every Diamond particle must constantly have sharp angular faces exposed to the work piece. Pressure-lok bond controls each abrasive grain just as long as facets of that Diamond present sharp cutting edges. Pressure-lok uses uniformly graded Diamond (no fines) of *warranteed* density in the world's finest bond.

TOO SOFT: Soft bonds may wear too rapidly around the Diamond grain leaving them insufficient support and causing premature release. Contact with the work piece can tear Diamonds from too soft bedding before they have reached optimum performance.

TOO HARD: Hard bond can cause the bond line to recede too slowly not allowing Diamond grains enough exposure to give new cutting faces. This causes over-heating and loading of the wheel.

be SURE . . . get

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HERE'S WHY PRESSURELOK WORKS BEST.

Pressurelok is the best of Diamond Wheels because it scientifically combines warranteed amounts of graded Diamonds distributed in constant density throughout a perfect bond which wears uniformly at the ideal rate of Diamond wear.

REMEMBER:

We've Never Failed To Deliver.

US **UNITED STATES DIAMOND WHEEL CO.**

835 ILLINOIS AVENUE AURORA, ILLINOIS

NEWS OF INDUSTRY *continued*

G. A. LaCas

C. J. VandeWater

George A. LaCas has been appointed director of the Industrial Division, and **Cyril J. VandeWater,** director of manufacturing, of the A.S.R. Products Corp. LaCas has been associated with the firm since March, 1946, in various capacities, and VandeWater joined the organization early in 1957 as chief process engineer.

Louis J. Van Orden, Jr. has been named sales manager, and **William W. Turner** is the new secretary of the American Emery Wheel Works of Providence 1, Rhode Island. The Providence firm's recent developments are the K and KP vitrified bonds for Aluminox grinding wheels and segments.

Bryant Chucking Elects New Officers

Elected to the Board of Directors at the Bryant Chucking Grinder Co. organization meeting held in Springfield, Vt., were **H. Glenn Bixby,** president of Ex-Cell-O Corp. of Detroit, **James K. Fulks,** executive vice-president of Ex-Cell-O, **Earl E. Conlin,** secretary and treasurer of Ex-Cell-O and **Donald H. McIver,** who is Ex-Cell-O's vice-president of Industrial Sales.

William J. Bryant was elected chairman by the new Board of Directors. **J. Hartness Beardsley** was elected president, succeeding William J. Bryant.

Richard W. Bowlen will continue to serve as first vice-president and has been elected chief financial officer. **Alan E. Stubbs** will retain his position as vice-president, and also general sales manager of Machine Tools. **Harold A. Bush** will continue to serve as treasurer.

These changes are part of the arrangements made as a result of Bryant becoming a subsidiary of Ex-Cell-O Corp. of Detroit. Bryant will continue to operate under Springfield management, retaining the same name.

New York Testing Laboratories, Inc., 47 West St., New York City, has announced a reorganization of its management. The Board of Directors has elected **Gerald J. Horvitz,** former Technical Director, to its Presidency. Other officers are: **Robert Slegman,** of Kansas City, Mo., Vice-President; **Gerald Harvey,** Secretary and Technical Director; **Roger Harvey,** Treasurer and Managing Director.

Horvitz is well-known for his inventions in the field of metal processing and electrode carbon for metallurgical refining.

Entering its fortieth year of business, the organization serves major industries and governmental agencies in the fields of metallurgical engineering, testing, evaluation of materials, etc.

Coated Abrasive Machine Show Set for June 10-13

Fifty-three manufacturers of coated abrasive machine tools will demonstrate their new products in the Third National Coated Abrasives Machinery Show, June 10-13, at the Product Engineering building of Behr-Manning Co. (division of Norton Co.), Troy, New York.

This year's show will include woodworking as well as metalworking machinery. Industrial production men will be invited to bring actual workpieces and test grind them on various machines, comparing machine speeds and pressures, abrasive grits, bonds and backings, contact wheel densities, lubricants, and other variables. All machines will be in full operation.

The popular "Abrasive Tech" feature will be repeated several times daily, with brief lectures by Dr. Hugh N. Dyer, Behr-Manning director of product testing.

YOUR QUESTIONS ANSWERED!

Send your questions and problems to GRINDING and FINISHING. Your problems may be similar to many others so let's get them out in the open. Our new question and answer section will attempt to answer the bothersome detail problems as well as the major difficulties. Please include all the facts involved in your question.

SCHEFFY

"Frankly, I won't need a vacation. I get plenty of rest on the job."

Rene Ramseier has been added to the American Buff Co., Chicago staff as design engineer for new products and project installations. Coming from Switzerland, Ramseier was also design engineer for the U.S. Engineering and Manufacturing Co., Chicago.

Jim Belanger has been appointed as Northeastern Michigan Sales Engineer for the American Buff Company, Chicago. His strong interest is in the field of polishing and buffing. He was formerly with the Chicago Rubber Company.

"Mr. Blotz does our internal grinding!"

Joseph L. Pulliam has been named sales manager for Micromatic Hone Corp., Detroit. Pulliam joined the organization in 1942 as a skilled mechanic. He was a Midwest district manager for eight years and has been the North Central regional manager since 1956.

Carroll B. Hoffman has been named manager of the De Laval Separator Company's (Poughkeepsie, N.Y.) Precision Equipment Division. In this capacity, he will be responsible for the development and promotion of new product lines allied to the company's centrifugal equipment. Prior to joining the organization, Hoffman was vice-president of J. M. Lehmann Co., Inc.

J. L. Pulliam

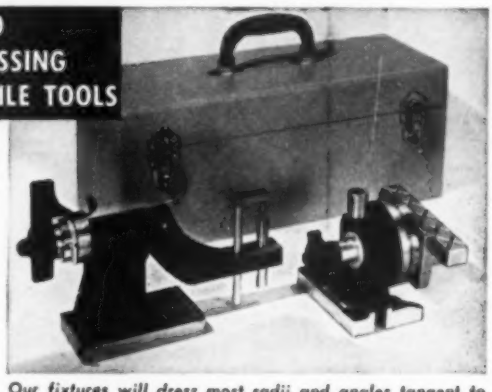
H. B. Seymour

Herbert B. Seymour is now vice-president-director of sales for the Wonder Building Corp. of America, Chicago manufacturer of pre-engineered trussless steel buildings and "Truss-Skin" roof systems. Prior to coming to the firm in July 1956, he was dealer development manager for Stran Steel Corp. in Detroit.

Now ANGLE TANGENT TO RADIUS WHEEL DRESSING WITH NEW VERSATILE TOOLS

MIGHTY GOOD AT ANY PRICE
BUT TOPS AT ONLY $149.50
(Both tools including diamonds)

The G-5 RADIUS DRESSER is a precision engineered tool that will dress either a convex or a concave radius from .015" to 1.750" on a 7 inch or 10 inch wheel, and it may be set to the exact radii desired. Graduated stops allow you to dress any desired portion of a radius. The spring tension journal insures chatter free operation. The G-2 ANGLE DRESSER AND TOOL HOLDER is actually two tools in one, having an easy to read vernier scale 0° to 180° giving accuracy within 2" of 1°; an excellent time saver to set up small jobs to be milled, drilled, tapped, etc., on any desired angle.



Our fixtures will dress most radii and angles tangent to each other, similar to those shown below.

FREE handsome, wooden storage box. Write for complete information.

PURCHASE EITHER TOOL SEPARATELY

Now you can purchase either the G-5 Radius Dresser or the G-2 Angle Dresser and Tool Holder separately if you so desire. (Without storage boxes)

G-5 Radius Dresser complete with diamond $80.00.

G-2 Angle Dresser and Tool Holder complete with diamond $87.50.

Replacement diamonds are always available for our units at a reduced price. Diamonds for the G-2 $5.00 each; diamonds for the G-5 $8.00 each.

Distributorship available in select territories

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Step-up feeds, speeds, production . . . finish your cutting tools with

HYPREZ OSCILLATING LAPPING MACHINE

Records prove that the Hyprez Lapping technique increases tool output per grind 200% to 700% — improves speeds and feeds 50% to 400%. The lapping wheels rotate as they oscillate across the firmly held tool—producing a geometrically accurate and scratch-free finish.

For Complete Information ask for Technical Bulletin LG-58

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ENGIS EQUIPMENT CO.
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MULTI-PURPOSE

BARREL FINISHERS

CUT COSTS WITH WIDE WORK-RANGE

MODEL V6 has full 6 cu. ft. capacity with any desired combination of 1, 2 or 3 compartment barrels. Fixed speed (23 rpm) or variable speed drive (12 to 36 rpm). Rugged, all-welded construction; ideal for steel ball burnishing, custom finishing or special processing as well as long production runs. A proved cost-saver in operation.

MODEL V4, identical to V6 above except has total four cu. ft. capacity and corresponding power reduction. Both models have the original Rampe "No-Seam" orange-colored vinyl barrel linings for easier cleaning — better wear— protection.

NEW CATALOG SHEET gives specifications and full details about the Rampe V6 and V4. Find out how much you can save with these versatile machines. Send for complete details and prices today.

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RESIN BONDED
ABRASIVE SANDING DISCS

Cut Costs

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- SAFETY IN USE

1 **MARVEL** will hold its shape better and lie flatter on the wheel in areas of the country where humidity is high.

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There are many more important reasons why you should use MARVEL Resin Bonded Abrasive Sanding Discs for the sake of Economy, Quality, Efficiency and . . . best of all . . . for your sake!

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M-B PNEUMATIC GRINDERS

Model M-CR-B

Model U-TR

Model HD-CR

Outstanding, powerful, fast-cutting tools of proven high efficiency. Designed for tough jobs and real production. Perform indefinitely and dependably. Precision made. Steel housing for safety. Also other models.

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ACCURACY .0002 T.I.R.

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SPINDLE SPEEDS 150 and 250 RPM Other Spindle Speed Pulleys Available

MODEL B943 MOTOR DRIVEN WORK HEAD

No. 11 B & S Tapered Spindle Standard Equipment. No. 12 B & S or No. 5 Morse Available at Slight Extra Cost.

Clip ad to your letterhead and send for Literature

K. O. Lee Company, Aberdeen, S. D.

NEWS OF INDUSTRY *continued*

Louis J. Pedicini is now manager of Manufacturing Engineering of Congress Die Casting Division and Congress Drives Division of the Tann Corp., Detroit. He was previously associated with the Process Development Staff at General Motors Technical Center.

F. R. Cruse is the new sales manager for the Stainless Processing Div. of Wall Colmonoy Corp. of Detroit. This division produces Nicrobraz brazing alloys for high-temperature service. Cruse has been assistant sales manager for the past two years.

L. J. Pedicini

F. R. Cruse

The **Whirl-Air-Flow Corp.** has made a change in officers coincident with the relocating of the plant and executive offices to 650 25th Ave., S.E., Minneapolis from Chicago. Originally, the firm was a division of Gerwin Industries, Michigan City, Ind.

E. E. Mueller

R. G. Pence

OBITUARY

Austin L. Hawk, a sales executive of the Manhattan Rubber Div., died of a heart attack at the age of 47 at St. Vincent's Hospital, Cleveland, Ohio, on Friday, March 21. Hawk started in the Chicago office of the Manhattan Rubber Div. in 1929 as a clerk, and progressed through various positions to manager of the Central Sales Region, the position he held at the time of his death.

Dr. W. Irving Clark, 78, retired medical director of Norton Company, Worcester, Mass., died April 5. Dr. Clark was associated with the company for 47 years, starting as company physician in 1911. He was a recognized authority on industrial medicine. During his career he wrote several books on the subject and for twelve years was an instructor in industrial medicine at Harvard University.

The appointees are as follows: **Edward E. Mueller,** president; **Ray G. Pence, George W. Anselman,** and **G. L. Babcock,** vice presidents.

G. W. Anselman

G. L. Babcock

Ludwig Zengeler has been named a vice-president of the NCG Division of National Cylinder Gas Company, Chicago, and **William T. Dellinger** has succeeded him as general superintendent of NCG industrial gas producing plants.

Zengeler has been general superintendent since 1936, and Dellinger joined the organization in December, 1955, as first manager of its new liquid oxygen plant in South Chicago.

E. Lapin

L. Zengeler

Eugene Lapin has been named as industrial sales representative for the Precision Grinding Wheel Co., Inc., on the West Coast. Lapin has had many years experience in the abrasive industry in California.

Do you have any kinks which would be helpful to the next fellow? Send them to GRINDING and FINISHING for publication. All material is paid for! Material can be in your own words, drawings can be rough pencil sketches; our editorial and art departments will do the rest. Send your Hints and Kinks to: Editor, GRINDING and FINISHING, 222 E. Willow Ave., Wheaton, Ill.

NO NEED FOR COSTLY DIAMOND WHEEL DRESSING

Diamond Grinding Wheels Contoured to Your Specs. . . . With our Electro Formed Nickel Matrix. The Ultimate in Shape Retention at a Fraction of Your Current Wheel Costs.

Diamond Quills Available from .014" diameter Cut-off Wheels down to .004" in thickness.

Sample Marshall Laboratories, Inc.
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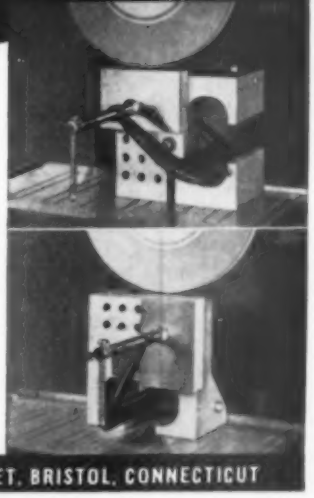
NEW **Federal Square Master ANGLE PLATE**

Will Grind A Work Piece Square The Easy Way Without Skilled Help

Designed for grinding a work piece to exact squareness, whether it be a component of a jig, fixture, gauge, or die; eliminating an indicator, precision square, surface plate, and use of top skilled help on routine jobs. Can also be used on layout work and inspection. This precision tool is built of high grade steel, stabilized, hardened and ground. ALL WORKING SURFACES ARE GUARANTEED TO BE SQUARE within two-tenths of a thousandth . . . (.0002). Write for complete literature describing other outstanding features.

Note adjustable set edge and recess for C-clamp. ➔



FEDERAL MACHINE TOOL COMPANY, EMMETT STREET, BRISTOL, CONNECTICUT

NEWS OF INDUSTRY *continued*

D. P. Myers

C. M. Smith

Precision Grinding Wheel Co., Inc. of Philadelphia announces the establishment of a new office in Milwaukee under the direction of **D. P. Myers.**

C. M. Smith has been appointed an industrial sales representative in Pittsburgh. Smith, together with R. G. Brewton, will handle all sales and service requirements in the area.

Mearll K. Shetler has been appointed Central Division sales manager, Coated Abrasives Div., Armour & Co., Alliance, Ohio. He will supervise sales activities in Ohio, western Pennsylvania, western New York, and western West Virginia.

The new manufacturing manager is **Royden C. Rinker,** who will have jurisdiction over all manufacturing, product research and development, and production and order scheduling activities for the Coated Abrasives Div.

YOUR QUESTIONS ANSWERED!

Send your questions and problems to GRINDING and FINISHING. Your problems may be similar to many others so let's get them out in the open. Our new question and answer section will attempt to answer the bothersome detail problems as well as the major difficulties. Please include all the facts involved in your question.

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Agents & Shop Personnel
Agents wanted to sell new silicone base all purpose, barrel finishing compound. Shop personnel may act as agents in spare time. Confidential.
Grinding & Finishing
222 E. Willow, Box No. 17, Wheaton, Ill.

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Reclaimers of
Industrial Diamonds and Diamond Powders
33 Box Street — Brooklyn 22, N.Y.
Our reclaiming department salvages diamond powders from wheels, sludges, hones, saw blades, cotton wastes or any type of diamond bearing material. We will submit quotations on an analysis basis.
Inquiries Invited!

WHY WASTE TIME?
Dress Profiles like these in a few minutes without Templates or Crusher Rolls with the Jeon Automatic Angle Tangent to Radius Dresser. It's fully universal.
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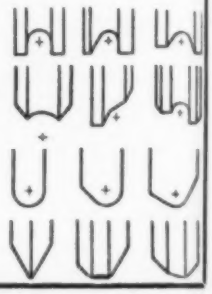
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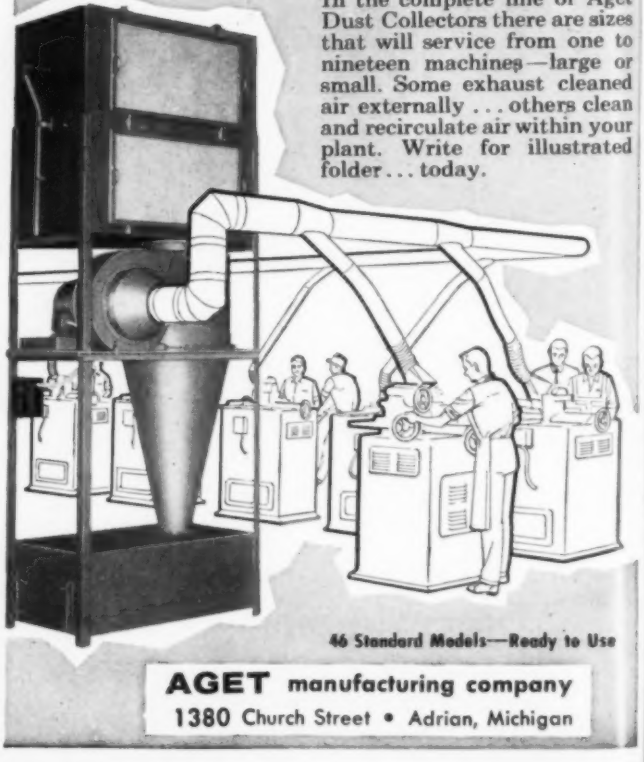
just **ONE** DUSTKOP STOPS DUST
heavy duty unit services up to 19 MACHINES
In the complete line of Aget Dust Collectors there are sizes that will service from one to nineteen machines—large or small. Some exhaust cleaned air externally . . . others clean and recirculate air within your plant. Write for illustrated folder . . . today.



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Continuous, automatic coolant cleaning eliminates manual cleaning of machine tool sumps. Production shut-downs and overtime maintenance costs are greatly reduced. Savings in coolants and oils are frequently substantial. Low cost, high result INFILCO equipment is available in capacities for single machine or central systems, for ferrous or non-ferrous metalworking. If you're cost-conscious, let us show you how to save.

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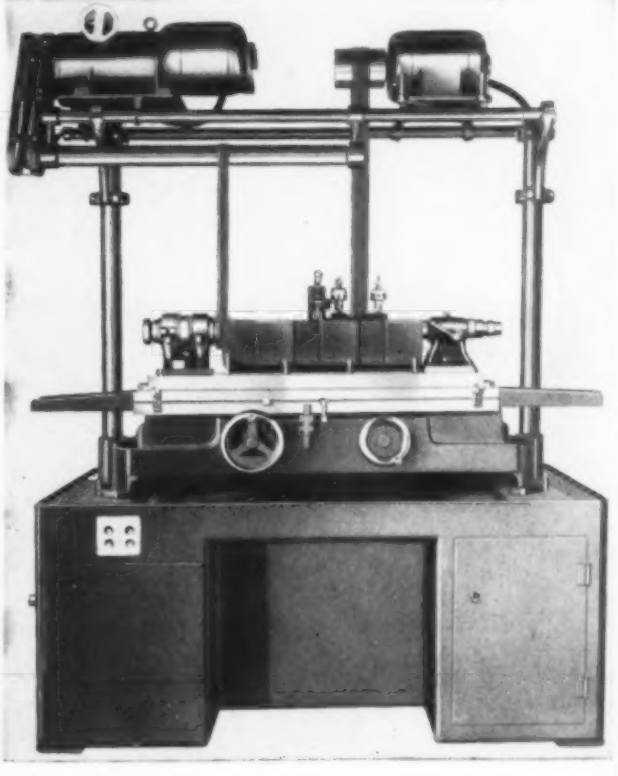
A GUARANTEE FOR YOUR CRYSTAL LAKE GRINDER

When purchasing a REX SUPERVAN HIGH SPEED STEEL SPINDLE for your Crystal Lake Grinder an additional $50.00 to the purchase price will give you a TWO YEAR SPINDLE GUARANTEE.

EASY OPERATION: CLOSE TOLERANCES: ACCURACY: FINE MICROINCH SURFACE FINISH

A CRYSTAL LAKE GRINDER will hold size as well as grind round from .000005 to .000020" and finish from One to Four Microinch SURFACE FINISH. The essentials in grinding are a round spindle, taper bearings, a spindle that can be adjusted periodically without the squashing of bronze boxes and to have belt pressure ninety degrees from grinding pressure so the bronze boxes will not wear out of round.

For example, fuel injectors, after having been rough ground, can be ground to .000010" roundness with a sixty grit wheel and one pass of the wheel.



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CRYSTAL LAKE GRINDERS

Since 1910

CRYSTAL LAKE, ILLINOIS

GRAND RAPIDS *accuracy for production grinding*

Now high speed, big surface production grinding can enjoy the same Grand Rapids accuracy that's always been a "must" for the toolroom. The Grand Rapids Model F Production Type Hydraulic Feed Surface Grinder offers the same micro-metric precision that has made Grand Rapids famous for accuracy everywhere.

It operates on a production basis – with table speed variations up to 150 ft. per minute, self-contained motor drive, motor driven coolant system and built-in wheel dresser. Upright column is a one-piece casting, wheel is 20" diameter and spindle is positioned to eliminate cramping.

It also has Vickers tandem pump, a one-shot lubricating system and a host of other features that make it easy as a breeze to operate – and very profitable to own.

Find out more about this remarkable machine and the six other Grand Rapids production grinders with a range of wheel diameters for every need. A note on your letterhead will bring descriptive literature.

Grand Rapids Model F Surface Grinder accurately grinds big surfaces at unsurpassed speeds

GALLMEYER & LIVINGSTON CO.
416 Straight Ave., S.W.,
Grand Rapids, Michigan

GALLMEYER & LIVINGSTON

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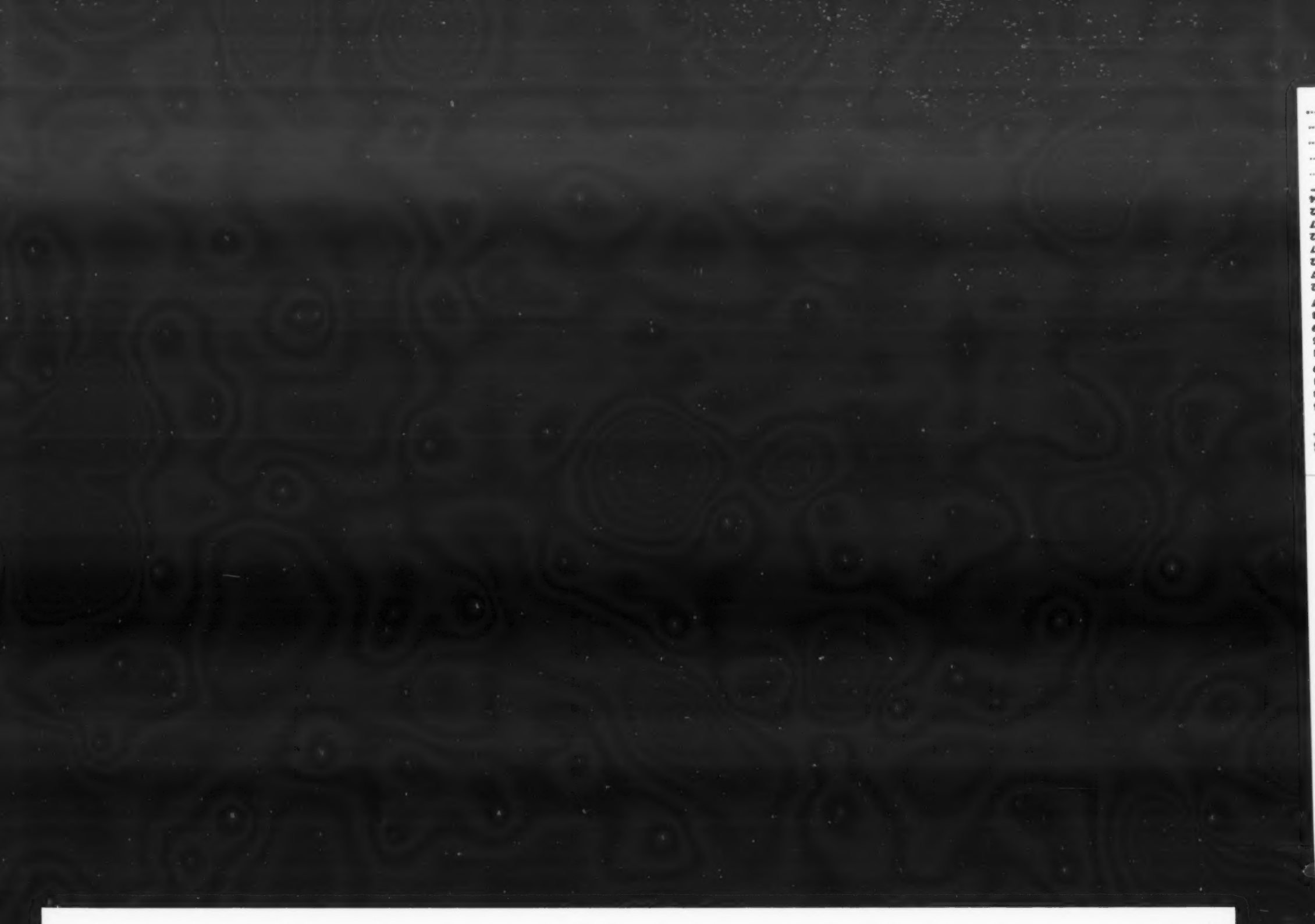

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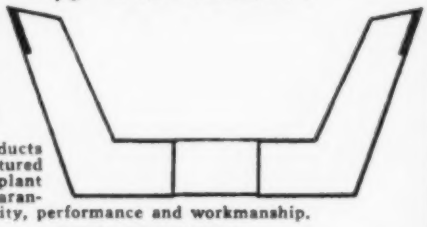

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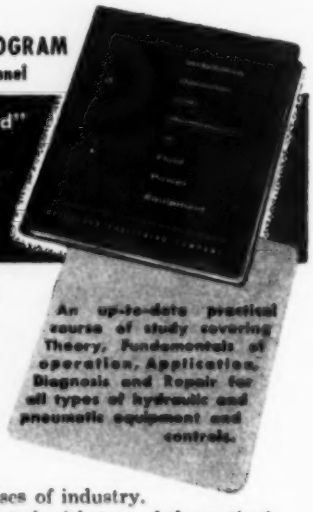
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